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CONTENTS

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PRESENT-DAY CONDITIONS AND THE RESPONSIBILITIES OF THE UNIVERSITY[1]

IT is proper that the office which I have the honor of representing to-night should be a cynosure, but it is unfortunate when in connection with any office, be it never so exalted, there is a tendency to fall into the Malapropian error of confounding a cynosure with a sinecure. I presume that it is with a view to avoiding this danger that an address has become one of the recognized duties pertaining to the chairmanship of this society, and it is but natural that the address should consider some topic connected with our scientific activities. Arguing upon this line, I was tempted to accept this as an opportunity for proposing the toast of 'our noble selves,' and to discourse upon the remarkable growth of the scientific spirit in the middle west during the last decade and the part taken by the members of this association in that growth. I decided, however, that I could not do justice to such a theme, for although 'good wine needs no bush,' yet unworthy words may mar a good tale.

But while I may not linger upon so

[1] Address of the chairman of the Central Branch of the Society of American Naturalists at the meeting held at the University of Wisconsin, March 29, 1907.

enticing a topic, the circumstances of our meeting compel a word of tribute to the part played by the University of Wisconsin in the upward movement. Fifty years ago the state universities were almost wholly teaching institutions, colleges rather than universities, institutions influenced by rather than influencing the standards of the subordinate educational grades. Thirty years ago the foresight of President Gilman made the Johns Hopkins University an exponent of the university ideal, before then but imperfectly realized, but for which the times were ripe, and in the acceptance of this ideal the University of Wisconsin was no laggard. In 1887 she gave earnest of her ideals in appointing to the presidency Professor Chamberlin, active then as now in the advocacy of investigation as a function of the university and whose words, spoken on the occasion of the jubilee of this university, might appropriately be writ large over the portals of all our state universities—"Research in every realm of a people's legitimate interests is an appropriate function of the people's organized self, the state, and of the people's organized instrument of research, the state university." The appointment to the presidency, in 1892, of Charles Kendall Adams was a pledge that the movement towards the higher ideals should not be retarded, and under his administration and that of Professor Birge the growth of the university along university lines is evidenced by the increase in the number of graduate students from 3 in 1887 to 119 in 1903.

History repeats itself. The university movement began in Wisconsin under the presidency of an active investigator, an acknowledged authority in geology, and we may with confidence look forward to a maintenance of high ideals and a continuance of the progress towards their realization under the present incumbent of the presidential chair, who has also enriched the literature of geology with the results of many careful and thorough investigations. And may we hope, Sir, that the duties of your high position may not deprive us of your active participation in investigation, and that you may continue to manifest your interest in higher university ideals by example as well as by precept. It is a privilege, and I doubt not for many of us an inspiration, to see for ourselves what the State of Wisconsin, under wise guidance, is now doing for higher education, and it is equally inspiring to note the promise the university holds out of continuing in the path of progress and of being in the future, as she has been in the past, a zealous foster-mother of productive scholarship.

In university education, as well as in other mundane affairs "the old order changeth, giving place unto the new." Time was when the sciences were but tolerated in the university curriculum, when the cultivation of the humanities was regarded as the only path leading to intellectual light. But this has all been changed and the sciences have come into their own. No longer do we find the humanists endeavoring to maintain a position of extreme pharisaism, nor is 'culture,' a term much abused and suggestive of the hot-bed or conservatory, regarded as obtainable only by a course in the humanities. No, all this has changed, and just as the dominance in higher education of the *literæ divinæ* gave place to that of the *literæ humaniores,* so the humanities have yielded to the scientific discipline or at least have been forced to admit it to a position of equality.

The causes for this are not far to seek. They are the result of the necessity for keeping the lines of higher education in touch with human interests, and never have these interests been so bound up in

the application and progress of scientific methods and discoveries as they are at the present time. The nineteenth century has been termed the age of science. How, I wonder, will the twentieth century be designated? For we are even now merely on the threshold of a period of scientific activity whose outcome is far beyond the ken of even the most imaginative seer. We must anticipate, nay, we must all rejoice, whether we be scientists or humanists, in the prospect of continually increasing scientific activity in the years to come and we must therefore look forward to a greater demand for the cultivation of the sciences in our educational institutions.

The developments in all departments of science in the last few years have been simply marvelous, and one does not need the shadows of even fifty years to bring into startling relief the enormous growth which has taken place not only in the extent and solidity of the foundations of science, but in the height, the adaptability, and, we may say, the elegance of the superstructures. I may be pardoned if, for emphasis, I introduce the personal element and state that even my span of life is coincident with that of the doctrine of natural selection, and that I can remember the interest and enthusiasm with which I read in my senior year at college the but recently published papers of Flemming and Peremeschko portraying the phenomena of karyokinesis and inwardly marveled that such observations, now the ordinary routine of an undergraduate course, were possible. Truly "the thoughts of men are widened with the process of the suns."

When one considers the relative recency of the discovery of the Hertzian waves and Röntgen rays, the actual novelty of our knowledge of radioactivity and of the ionic theory; when one notes the revival of the Mendelian law and the important observations on variation and inheritance which it has evoked; when one recalls the important contributions to our knowledge of the physiology and mechanics of growth which the modern science of experimental morphology has supplied; and, not to prolong the list indefinitely, when one reviews the recent advances in our knowledge of the principles underlying serum-therapy—how can it be doubted that we are but on the threshold of an era of scientific activity whose outcome will far transcend that of the century which has passed? The importance and far-reaching possibilities of the purely scientific problems now confronting us can not fail to stimulate investigation in all departments of science and must continue to attract, in increasing numbers, men who will find their greatest pleasure in the prosecution of science for the truths it will reveal. And, furthermore, the possibilities in the way of the practical application of the results of pure science, now seen as through a glass darkly, must create a continually increasing demand for men thoroughly grounded in scientific principles, who can make realities of the hopes which pure science awakens. So certain is this and so certain is the correlation between scientific progress and national development, that the fostering of scientific investigation must become, even to a greater extent than now, a question of national concern.

But even although the tendency is strong towards the maintenance of scientific institutes by the government and although we have already witnessed the application of private wealth to the establishment of special scientific laboratories, yet it is to the universities that we must chiefly look now and in the future for the maintenance in scientific work of the high ideals which are the life of scientific progress. For it is from the universities that the ranks of those who will serve in govern-

mental and private laboratories must be recruited, and upon the universities rests the responsibility not only of adding directly to the world's stock of knowledge, but also of supplying men capable of grappling worthily with the problems which may confront them and imbued with a proper sense of the dignity of science and of the obligations it imposes upon its devotees. The task of the university is, therefore, a double one and doubly serious, and it may not be amiss to enquire into some of the conditions necessary for the accomplishment of its task.

The prime necessity, the selection of men for positions on the staff who are competent as both investigators and teachers, need hardly be considered. It follows from what has already been said. But this much may be added, that a competent investigator, even though he be but a mediocre teacher, will do more to fulfil the ideal for which a university should stand, than will a competent teacher who does not investigate. Men there have been, like the late Sir Michael Foster, whose death we all deplore, who while taking but little part in actual investigation, have nevertheless by the healthful stimulus of their teaching created a school of ardent and brilliant investigators. But such men are *raræ aves* and the zealous investigator by his enthusiasm and example will, as a rule, do more to raise the standard of scientific scholarship than will a non-investigating teacher. And, I believe that as a general rule the investigator will prove a more capable teacher than the non-investigator for the simple reason that he will be more apt to keep abreast with the progress of his studies and inclined to rely upon original sources for the information he imparts rather than to seek it in the more accessible text-books.

But, after all, this is a matter which does not require special comment. The governing bodies of our universities are coming to recognize more and more the necessities in the case and the standards of fitness for staff appointments are rapidly rising. More serious is the failure of the authorities to perceive the conditions necessary for the full fruition of scholarship. It is a sad comment upon the ideals of a governing body when it bases its estimate of the value of a teacher upon the number of hours he devotes to actual class work and to service upon various academic committees. And yet how many of us have heard such a standard of efficiency advanced in all seriousness. A high grade of scholarship can not be maintained, investigations of a high order can not be carried on by men whose physical and intellectual energy is exhausted by the routine of the class-room and executive cares. I would not for a moment contend that even the most capable of investigators should be entirely relieved of his duties as a teacher, indeed, I am convinced that from his teaching duties an investigator may obtain much stimulation and inspiration, but I do protest against a competent man being so burdened with class-room duties that he but half fulfils the responsibilities of his position. It is neither good business policy nor good ethics. It is the office of the university not only to impart knowledge but also to add to it, and the one duty is as obligatory as the other.

But the blame for the non-fulfilment of both duties does not in all cases rest entirely with the university authorities. Frequently it rests with the teacher himself, who, in a desire, in itself a most laudable desire, to make his teaching thorough to the limits of his ability, overburdens himself with multifarious courses. Such an one is proving false both to himself and to his university; he is failing to fulfil his responsibilities. Far better were

it to teach thoroughly only the principles of his subject and to devote some of his energies to the advancement of knowledge in his chosen field. And this suggests a consideration of the effects of summer sessions, now so much in vogue, upon productive activities. I do not feel justified in giving at present an *ex cathedrâ* pronouncement upon the merits of summer sessions; they seem to make for both good and ill; but whether the benefits derived from them compensate for their ill-effects in other lines remains for the future to determine. If they can be conducted on lines which will suppress an imminent danger of superficiality and which will not interfere with the investigational activities of members of the university staff, by demanding that men who have already spent nine months of the year principally in class-room work shall devote to similar work an additional period of six weeks or more of the time they have for uninterrupted devotion to investigation, if these dangers can be avoided the summer session is justifiable; otherwise its influence is pernicious.

One of the allurements of the summer session is the opportunity it affords for a small addition to a diminutive income. And in the necessity for this lies one of the obstacles to greater scientific achievement in the universities. The *res angusta domi* do not conduce to that condition of equanimity necessary for good scientific work and many a promising investigator has had his ambitions quenched and his mind turned to the more pressing material necessities of life by the lack of sufficient recompense for his work. This is a matter, however, to which attention has frequently been called of late and, it is a pleasure to say, with some prospect of remedy.

I have already pointed out as one of the causes for the position scientific studies now hold in university education, the demand for men trained in scientific methods. And, as is so often the case, the favoring current carries with it seeds of danger to true scientific progress. This danger is the commercialization of the university, and it is one which in this country, more than in any other, needs careful watch and ward. The university has been satirically defined as a place where nothing useful is taught and, taking the word useful in its intended meaning, I hold that the definition, intended as a reproach is an honor. What the university and university education should stand for is not utilitarianism, its function is not to turn out masters of the technicalities of this or that profession, but above all men with a sound training in fundamental principles. That the university should offer lectures and other forms of instruction in the history and theory of music or painting is right and proper, but that it should turn out expert pianists or finished artists is absurd. We may even look with equanimity upon courses in domestic science or on properly conducted commercial courses, but that the university should descend to the education even of good cooks or successful drummers is something horrible to contemplate. And so with the sciences. Let the first care of the university be to thoroughly educate men in the principles of the sciences, and worthy results will inevitably follow, but should the university become a technical school progress will be retarded. I do not mean to say that the practical application of scientific principles should be absolutely disregarded in the university; far from it. For the *argumentum ad rem* is often the most powerful means for pressing home a scientific deduction. But what I do maintain is that it is the teaching of the principles of pure science which underly practical application that should be the essential function of the university, its aim should not be to turn out engineers, archi-

tects, physicians, pharmacists, or dentists, but to furnish men thoroughly grounded in the principles upon which the successful and scientific practise of these professions depends.

All this will undoubtedly be regarded as purely academic theorizing by the Gradgrinds who arrogate to themselves the adjective 'practical.' But which is more practical, more beneficial to the individual and to the community which he serves, the education of an empiric or the training of a scientist? Surely there can be no hesitation in the answer. Montaigne said, long ago, 'To know by rote is not to know.' It would be instructive to test our university education by this standard and ascertain how far, by precept and example, it is, especially in the professional schools, following the straight and narrow path. To what extent is the desire for immediate financial success, and that on no modest scale, affecting the work of our students? Are our faculties yielding to this desire on the part of the students and in their teaching placing more stress on the application than on the principle? And to what extent is this same desire for financial prosperity calling our teachers from investigation to more lucrative employments and impairing their usefulness both as preceptors and as exemplars? I have not considered these questions as part of my theme, and will leave them with you for private consideration.

In the development of investigation as a prime function of the university, there is a danger, however, that its advancement may be pushed too rapidly, in the sense that men, too slightly grounded in the principles of their science, may be pushed into special lines of study and that university education may mean the training of narrow specialists rather than the development of broad, scholarly minds. Lowell said of Harvard that he "would rather the college should turn out one of Aristotle's four-square men, capable of holding his own in whatever field he may be cast, than a score of lop-sided ones developed abnormally in one direction," and surely this is what each of us would wish for his alma mater or for the college in which his lot is cast. It is a short-sighted policy that forces or even allows immature men to enter upon investigation. It may increase the quantity of the productive work of the university, but the increase will be at the expense of the quality, and in the long run will redound to the credit neither of the university nor of the individual members of its staff. And, after all, the investigator is born, not made, and for the men who have not an innate aptitude for investigation,

> Selbst Pallas kommt als Mentor nicht zu Ehren,
> Am Ende treiben sie's nach ihrer Weise fort
> Als wenn sie nicht erzogen wären.

All students can not be investigators in the ordinary sense of that word, but all should be trained along broad lines, trained to look to original and reliable sources for their information, trained to seek for the causes of phenomena and events, trained, in short, in the methods of the investigator. Only after a student has successfully undergone such a discipline, and surely the ordinary undergraduate course is none too long for its completion, should he be allowed to undertake investigation. The tendency to make a certain number of years of college training a condition for entrance upon a professional education in medicine is one of the most hopeful signs for the progress of that science, and fortunate are the schools now in a position to demand a complete collegiate course as a preliminary to the professional education. Let us hope that the example of the medical schools will soon be followed by other professional departments and that for all professional studies, including under that

title investigation, a broad foundation may be demanded as a prerequisite. Thus will the dignity and usefulness of the professional schools be increased and thus will the university fulfil its trust by giving to the service of the state sons strong to withstand the wayward blasts of popular superstitions, keen to search out and expose their fallacies, and strenuous in laying secure foundations for advancement in literature, science and the arts and in fostering their development and application.

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THE CHEMIST AND THE COMMUNITY[1]

ON April 18 of this year there occurred at San Francisco a vast catastrophe as the result of which more than 1,000 people are said to have lost their lives while 250,000 were rendered homeless in the midst of a conflagration involving an area of six square miles and a property loss of at least $300,000,000. On April 19 there was run over and killed in the streets of Paris a simple, unassuming, absent-minded man. The Boston *Herald* in an editorial comment upon the two events said that it might well be questioned whether of the two the accident in Paris did not in its broad relation to the welfare of mankind constitute the greater calamity. This was an amazing thing to say of the death of any man, even of one so preeminent in attainment as Professor Curie. Let us consider why it was said and upon what basis it may, if at all, be justified. It was said in tacit recognition of the fact that the quality of intellectual leadership is one of the rarest and most precious possessions of our race and that the world can better afford to lose a city or a province than one of its great investigators, philosophers or teachers. One pregnant thought, one flash of insight from a master mind, has often done more for the advancement of mankind than all the toil which built the pyramids. The result of the researches of Professor and Madam Curie has been as you all well know to change our whole conception of the material universe and to bring within the reach of our perception stupendous natural forces the existence of which had not even been suspected. The effect has been even more far-reaching for with the farther vision has come new views of what life is and of our relations to this greater universe, such views for instance as those put forth by Sir Oliver Lodge in his recent 'Life and Matter.'

In the accounts of the war between Japan and Russia frequent reference was made to the parties of chemists who far ahead of the main army were testing water supplies and posting notices which warned the oncoming troops where danger from polluted water must be avoided. It seems to me that this little vanguard well typifies what the chemist should stand for and where he should be found in his relations to the community. He is or should be essentially a pioneer rushing forward and serving the community in the best sense in serving science.

It has doubtless occurred to some of you that chemists as a professional class do not have that direct and strong hold on the regard of the community which has been established and is well maintained by physicians, lawyers and ministers. The reasons for this are not far to seek. The work of the chemist deals with things and in carrying on this work he is rarely or never brought into such direct and vital personal relations with individual members of the community as the family doctor who presides at birth, the lawyer who conducts affairs, or the minister to whom one turns in times of stress and trouble. Moreover,

[1] Read at the general meeting of the American Chemical Society, on December 27, 1906, at Columbia University.

every one knows by personal contact and experience something of the field and manner of work of the members of these professions, whereas comparatively few in the community at large have any definite or adequate notion of the scope and methods and possibilities for usefulness of the science of chemistry. This is even true of an amazing number of our manufacturers and this ignorance constitutes a very serious menace to the continuance of our prosperity. To-day as never before knowledge is power and science is only knowledge at its best. Our industrial achievements, impressive though they are, cannot be properly measured without some standard of comparison, and such a standard we have in Germany. The question for our manufacturers to answer is not what have they done, but what would Germany have done with our vast resources at her command. There is no escaping from the answer that by that measure we have failed and are repeating failure. Doctor Pritchett in a recent article has said "Perhaps at our present stage of development in such matters no other preliminary work needs more to be done than some work of popular education relative to what research is," that research which a famous German chemist quoted in the same paper declares to be 'the greatest financial asset of the fatherland.' The present and pressing duty of the chemist in his relation to the community is therefore to do his utmost in self-respecting ways to develop in the community an intelligent appreciation of his proper place within it, an understanding of the nature of his science and its potentialities for helpfulness. We shall perhaps arrive at this understanding most directly by considering for a moment something of what the chemist has already done for the community.

Chemistry enters so intimately even though unobtrusively into every phase of modern life and thought that it is perhaps impossible to present in any adequate degree the real dependence of the community upon the work of chemists past and present. Industrial revolutions are seldom chronicled and more rarely celebrated, though their influence upon the welfare of mankind may be as profound as that of other revolutions the records of which are traced in blood. It can no longer be said as was said to the father of chemistry as he passed out to execution, 'the republic has no need of chemists.' If we were to take away what chemists have contributed the whole structure of modern society would break down at once. Every commercial transaction in the civilized world is based upon the chemist's certificate as to the fineness of the gold which forms our ultimate measure of values. Faith may remove mountains but modern society relies on dynamite. Without explosives our great engineering works must cease and the Panama canal no less than modern warfare becomes impossible.

Prices rise and fall with the variations in the gold supply as the barometer responds to the changing pressure of the atmosphere, so that to the cyanids and chlorination processes which have so greatly increased the world's supply of gold must be ascribed a potent influence on market prices everywhere. With the development of the steel industry have come great fortunes and greater corporations bringing with them social benefits and social problems hitherto unknown. This industry rests preeminently upon the work of chemists as its greatest master has been quick to testify and is to-day at every point under the strictest chemical control. The Bessemer process alone was estimated by Abraham S. Hewitt to add directly and indirectly $2,000,000,000 yearly to the world's wealth. Of this vast sum Bessemer himself retained in all about ten million

dollars, or one half of one per cent. of his contribution to the community in a single year. And this is characteristic generally of the rewards which come to chemists. They are not taken from the common fund, no man is poorer for them, their recipient has made others richer in those rare cases in which he has become rich himself.

In the last century the United States has grown from a narrow fringe of feeble states along the Atlantic coast line to an imperial domain which spans the continent, and yet for the purposes of business and administration it is a smaller and more compact community than it was a hundred years ago. One reason for this anomaly is found in the development of our great transportation systems and as to these it may be said that every signal lamp burns more brightly, every pound of freight is hauled more cheaply, and every traveler carried with greater safety because of the work of chemists and preeminently the work of Dr. Dudley and his confreres in standardizing and holding to the standard the materials entering into railroad equipment of every kind.

All the activities of the community are based in the last analysis on those which have to do with agriculture and as to those in the United States Secretary Wilson has said "Every sunset during the past five years has registered an increase of $3,400,000, in the value of the farms of this country," which farms have produced in a single year wealth aggregating six and one half billion dollars. Chemists from Liebig down have done much to contribute to these amazing totals by their analyses of soils and of plant products, the adaptation of fertilizers to soil requirements and the needs of special crops; the utilization of what were once waste products like corn oil, cotton oil, the gluten from starch factories, casein from skim milk, cream of tartar from the lees of wine and so on through an almost endless catalogue, and yet great as are the figures given as the output of American agriculture there can be no doubt that they might be doubled by the general application of the best teachings of agricultural chemistry and science. So much agriculture already owes to chemistry while for the immediate future is the promise of the commercial fixation of atmospheric nitrogen with all that that implies in increased productive power of the soil.

The relations of modern life, the interdependence of communities far distant from each other and the adjustments and readjustments which are constantly made necessary in these relations, has brought it about that chemistry has not always benefited agriculture but has on the contrary in some signal instances been disastrous to special though important agricultural interests. The synthesis of alizarine from anthracene in 1868 by Gräbe and Lieberman and their later commercial preparation of the coloring matter from anthraquinone proved for example a death blow to the cultivation of madder of which forty years ago the annual production was about 500,000 tons, substantially all of which, as the Avignon peasants sorrowfully say, is now 'made by machinery.' Similarly, Baeyer's synthesis of indigo upset the social economy of great regions in India where his name was never heard and today at least one half of the entire consumption of this dye stuff is produced in German chemical plants. The manufacture of these coloring matters is among the great triumphs of organic chemistry, but the inorganic chemist can point with equal pride to the production of ultramarine now sold for half the price of copper, whereas in the form of lapis lazuli it was in the time of Liebig a dearer thing than gold.

Chemists here and abroad have hardly

finished celebrating the fiftieth anniversary of the discovery of mauve, the first of the coal tar colors, and have been happy in the knowledge that its discoverer was still among them to receive their congratulations and rejoice with them at the splendid outgrowths of his work. In the addresses to Perkin at the time it was estimated that in the industries based on his discoveries no less than $750,000,000 is invested. As a result profound economic changes have been brought about not only in England and Germany, but in India, South America, Mexico, China and Japan. Our fastest dyes are now produced synthetically, the range of the dyer's art has been widely extended and through collateral channels new and powerful agencies for combating disease and suffering have been placed in the hands of physicians everywhere.

Few of the industries upon which the prosperity of the country and the comfort and material well-being of its inhabitants depend have not experienced within the memory of those before me changes so profound and so far-reaching in their effect as to be fairly described as revolutionary. I believe it to be within the truth to say, that in the great majority of cases these changes have been initiated or accelerated by chemists. For our present purpose and before this audience, it is unnecessary, even if it were possible, to catalogue the materials for which, at prices permitting their general use, the community is indebted to the chemist. They comprise a large proportion of the things which are regarded as among the necessities of life, without which comfortable, or even decent, living, would be impossible. With reference to productive industry generally, it may be said that in many instances the chemist is the most effective agent for standardizing materials, controlling the course of processes, and minimizing wastes.

The chemist has been similarly active in respect of matters pertaining to the public health. One has but to recall the splendid pioneer work of Drown in connection with the study of public water supplies in Massachusetts, work which is still regarded everywhere as the standard for other communities. The sanitary engineer can not work without the chemist, the physician relies upon him for the most potent means for avoiding or arresting disease, or alleviating suffering and domestic economy and science make increasing demands upon the laboratory.

In no way has the community benefited more through the 'diffusion of useful knowledge among men' and few if any agencies for the diffusion of such knowledge have worked to better purpose than the Smithsonian Institution, which stands as an enduring monument to the wisdom and public spirit of Smithson, who was a chemist.

We, who are 'heirs of all the ages,' have no more imperative duty upon us than that of transmitting to our successors the experience and wisdom which has been handed down to us, and in the execution of this duty the chemist has nobly borne his part. To Harvard the profession has given Eliot; to Stevens Institute, Morton; to the Massachusetts Institute of Technology, Crafts; to Lehigh, Drown; to Johns Hopkins, Remsen; to the University of Iowa, Schaeffer; to the Columbia School of Mines, Chandler. Through such educators as these, chemists have had a direct and lasting influence on public opinion, and the thought of the generation which is to follow us. Similarly, but more intimately, the heads of the chemical departments in our universities and technical schools come into contact each year with thousands of students who are influenced far more profoundly by the personality of their teacher

than by the subject matter of his pedagogic efforts.

The chemist has another and more general claim upon the community by reason of the intellectual interest which his researches add to life. Moissan extends the range of our activities to the highest temperature of the electric furnace, and we produce within our laboratories the conditions obtaining in the sun. Dewar brings us within a few degrees of the absolute zero. Bunsen and Kirchoff teach us the composition of the stars. Avogadro and Ampère picture to us the mechanism of gases. Dalton supplies a hypothesis which for almost a century suffices to explain the constitution of matter and the course of chemical change. Curie opens out new vistas in which the old thought is seen in new relations, which give to the universe, as we have known it, entirely new aspects.

Briefly and baldly as I have set forth the claim on the community which chemists may fairly make, it is, nevertheless, a showing for which no apology is required. There are perhaps as many as ten thousand chemists in the country; the census of 1900 gives 8,847 as contrasted with 125,000 lawyers and 93,000 doctors. In the light of these figures who shall say that the chemist has not borne his part as should the happy warrior in the fight against ignorance, material obstacles and the phantasms of the mind.

So much at least the chemist has done and may be counted on to do for the community; but this by no means ends his obligation, if the profession as a class is to attain its true success which is the achievement of the best of which it is capable in its broadest relations to the community at large. Dewar has said that the 'one great object of the training of a chemist is to produce an attitude of mind,' and Principal Caird has defined the scientific habit of mind as 'the faculty of grasping the universal element in all human knowledge.' Karl Pearson puts the same thing in a slightly different way by saying "The scientific man has above all things to strive at self-elimination in his judgments, to provide an argument which is as true for each individual mind as for his own." When we add to this the absolute honesty toward himself and others and toward things as well which should characterize the chemist who has responded to his training and supplement the whole by precise and special knowledge and the ability to do the things within his sphere, we not only have all the essentials of good citizenship, but an ideal basis for leadership in the great work of coordinating and utilizing and making amenable to law the new powers and resources and discoveries with which the world is now congested. The chemist from the very nature of his work and training should be the unswerving enemy of graft in every form. He should not be content with a mere passive resistance and a merely personal honesty, but should take an active and aggressive part in the fight against corruption and frauds, whether these involve sea-water gold, salted mines, corporation mismanagement or politics. He should more frequently be found on school boards and boards of health and special commissions, and I venture even to suggest that chemical societies should far more often act as a body or through committees to expose abuses or battle for their remedy. Such conditions as prevailed for years in the water supply of Philadelphia, where they are not yet fully remedied and which still prevail in many sections of our country, the stagnation and inefficiency of our patent office, the fraud on and danger to the community involved in the methods of some makers of proprietary medicines, the petty graft which many manufacturers of honest products meet with in their sale

—such things as these are things for the profession as a whole to fight if the community is to have the benefit of its best service.

The number of chemical problems with which manufacturers, large and small, throughout the country are grappling, consciously or unconsciously, must be very great indeed, and their inability to solve them readily constitutes a heavy drag upon production. There is little doubt that a large proportion of these problems have either been solved already without their knowledge or are of such a nature that they require little more than their statement to a chemist of experience to permit of their immediate solution. They still remain problems either because the manufacturer has no proper conception of what chemistry can do for him, or because the chemist to whom they may have been submitted is ignorant of the conditions injected into the problem by the requirements of practise. Were both parties to the matter properly informed I have no doubt whatsoever that ten times the number of chemists now at work in the United States could be employed to the great benefit of our industries and the advancement of the position of our country in the world. One obvious step towards a remedy for the situation is a closer touch and cooperation between societies of chemists and associations of manufacturers. Manufacturers might well appear from time to time before the one and chemists before the other to the good of both. As James P. Munroe has said in a paper on applied science and the university, "Not, broadly speaking, what the bachelor or doctor knows, but how he knows it, and to what use he can put this knowledge measure his real education."

As a technical chemist I speak with some diffidence to those engaged in pure science, but I believe the question may be fairly put, whether both science and the community might not be benefited by some readjustment of our ideas as to what constitutes pure science and the extent to which the exponent of pure chemistry may properly allow himself to be led into industrial work. Scientific research in Germany is 'the greatest financial asset of the fatherland' because there the greatest minds in chemistry come into close touch and contact with the problems of commercial enterprise. The synthesis of indigo is no less a triumph of pure chemistry because of its industrial importance, and a synthesis of the resins in the juice of the milk weed can hardly be regarded as more commendable from any point of view than a synthesis of India rubber would be. Where, then, there is so much to do is it not possible to pick the problems with more direct reference to the immediate needs of the community? By far the larger part of our best research is carried on now in the laboratories of our great industrial plants, and if the teacher and the individual investigator are to match it they must in case of most of them have the broadening influence of personal contact with the conditions and needs of industry. Through them their influence will be transmitted to their pupils whose grasp upon the science will be thereby strengthened at the same time that their possible usefulness to the community is increased.

Under such conditions the relation in which the chemist stands to the community in respect of its affairs can not fail as time goes on to become one of increasing dignity and power for good unless chemists themselves forget that the surest path to influence and position is through altruistic service.

As we look back upon the great achievements of the past and view the monumental figures from whose trained brains and hands they came, as we study the vast accumulations of fact and the broad general-

izations by which these stores of knowledge are bound together, we are apt to conclude that where so much has been wrested from the unknown there can be little left for new discoverers. The true view, of course, is that which regards our present knowledge as a sphere floating in the infinite of the unknown. As the sphere enlarges so it touches upon more points of the unknown. As our knowledge grows so also does our ignorance increase.

We have only to consider the chemical processes as carried out by plants and animals to realize how crude and clumsy our own present methods are. There is still plenty for the chemist to do and the prospect which lies before us is not only rich in promise for the material welfare of mankind, but one which in its realization must affect profoundly man's view of the universe and of his relation to it. Few of us can remember the intellectual stimulus which followed Wohler's discovery that a compound which seemed peculiarly to represent the product of vital forces could be reproduced within the laboratory, but most of us, I firmly believe, will witness the breaking down of the line which now separates living matter from dead matter. With it will come an intellectual revolution the result of which can only be to bring the whole world closer to 'the God of things as they are.'

ARTHUR D. LITTLE

ANTHROPOLOGY AT THE NEW YORK MEETING

THE joint meeting of Section H of the American Association for the Advancement of Science, the American Anthropological Association and the American Folk-Lore Society held at Columbia University, New York City, December 27, 1906–January 1, 1907, was notable for the number of working anthropologists present as well as for the length and excellence of the program. Coming, as it did, so soon after the International Congress of Americanists in Quebec, fear had been expressed that the New York program might be but the gleanings of a field already thoroughly harvested. That new fields were entered may be readily seen by a survey of the program, which included fifty-six numbers in addition to the addresses of the president of the Folk-Lore Society and of the retiring vice-president of Section H.

BUSINESS AND SOCIAL FUNCTIONS

The Council of the American Anthropological Association and the Sectional Committee of Section H held a joint business meeting on December 27, at which the retiring vice-president of Section H, Dr. George Grant MacCurdy, presided.

Professor William H. Holmes presented an official communication from the Anthropological Society of Cologne, Germany, inviting the American Anthropological Association and members of Section H to take part in the International Congress of Anthropology to be held at Cologne[1] in August, 1907; and recommended that the chair appoint a committee to further the interests of the Cologne Congress. On formal motion to that effect the chair appointed the following committee: W. H. Holmes (chairman), Franz Boas, Chas. Peabody, W J McGee, F. W. Putnam, A. L. Kroeber, K. von den Steinen, G. B. Gordon, G. A. Dorsey, C. V. Hartman, J. C. Merriam, G. F. Wright, J. W. Fewkes, S. Culin, David Boyle, A. Hrdlicka, F. M. Palmer, C. A. Peterson, S. Hagar and G. G. MacCurdy (*ex officio*).

The question of the advisability of changing the name of Section H, Anthropology, so as to read 'Section H, Anthropology and Psychology' came up for discussion. On motion the chair appointed a

[1] Place of meeting has recently been changed to Strasburg; the date is August 4–8.

special committee with power to act and to submit their action for the approval of the Council of the American Association for the Advancement of Science: Franz Boas (chairman), W. H. Holmes, A. L. Kroeber and J. McK. Cattell. The resolution submitted to the council by this committee is as follows:

First. The recommendation of the Committee on Policy to change the designation of Section H from 'Section of Anthropology' to 'Section of Anthropology and Psychology' is approved.

Second. The Committee recommends to the consideration of the Council and of the Committee on Policy the desirability of a better coordination of the sections and of the affiliated societies, particularly the desirability of having the president and the secretary of one of the affiliated societies act at the same time as sectional vice-president and sectional secretary. The Committee also recommends to the Council and to the Committee on Policy a consideration of the question whether, in view of the close affiliation of scientific societies, the discontinuance of sectional meetings and of the sectional organization may not be desirable.

In harmony with the foregoing resolutions, the section deviated from its custom in regard to officers and named for vice-president the president of an affiliated society, the list of sectional officers elected, subject to the approval of the General Committee of the American Association for the Advancement of Science, being:

Vice-president—Franz Boas.
Member of the Council—W J McGee.
Member of the Sectional Committee to serve five years—W. H. Holmes.
Member of the General Committee—M. H. Saville.

The officers of the American Anthropological Association are:

President—Professor Franz Boas, New York.
Secretary—Dr. George Grant MacCurdy, New Haven, Conn.
Treasurer—Mr. B. Talbot B. Hyde, New York.
Editor—Mr. F. W. Hodge, Washington.

A number of social functions were arranged by the local executive committee for the American Association for the Advancement of Science and the affiliated societies.

The president of Columbia University received in Earl Hall from nine to eleven o'clock on the evening of December 27.

A luncheon was given at the College of the City of New York, 138th Street and Amsterdam Avenue, on December 29, with addresses preceding, and an inspection of the new buildings following.

An invitation was extended by the board of trustees of the American Museum of Natural History to be present at the ceremonies attending the unveiling of the busts of ten American men of science presented to the Museum by Mr. Morris K. Jesup, which took place on the afternoon of the twenty-ninth. In the absence of Mr. J. Pierpont Morgan, Professor Henry F. Osborn presided. The presentation on behalf of Mr. Morris K. Jesup was made by Dr. Hermon C. Bumpus; and the acceptance on behalf of the trustees, by the Honorable Joseph H. Choate. Brief memorial addresses were made: Benjamin Franklin, by Dr. S. Weir Mitchell; Alexander von Humboldt, by His Excellency Baron Speck von Sternburg;[1] John James Audubon, by Dr. C. Hart Merriam; John Torrey, by Dr. Nathaniel L. Britton; Joseph Henry, by Dr. Robert S. Woodward; Louis Agassiz, by the Rev. Edward E. Hale;[2] James Dwight Dana, by President Arthur T. Hadley; Spencer Fullerton Baird, by Dr. Hugh M. Smith; Joseph Leidy, by Dr. William K. Brooks; Edward Drinker Cope, by Dr. Henry F. Osborn.

[1] Address read by Count Hatzfeldt, first secretary of the embassy.

[2] Letter read in the absence of Dr. Hale.

On the evening of the twenty-ninth there was a reception at the American Museum of Natural History by the trustees of the museum and the New York Academy of Science, with an exhibition of scientific progress by the Academy, including demonstrations and short addresses.

A dinner and smoker was given by the American Ethnological Society on Friday evening, December 28, at the Explorer's Club, 23 West 67th Street, to the American Anthropological Association. After the dinner those present were invited to the Knabe Building to inspect an archeological collection made by Professor M. H. Saville in Ecuador for Mr. George G. Heye.

ADDRESSES AND PAPERS

Dr. A. L. Kroeber's address as president of the American Folk-Lore Society was on the 'Musical Systems of the Indians of California.' Myth, ceremony and song are fused into one among the Mohave. The Indian music of California is noted for its simplicity. The elements are few and repeated endlessly; but the repetition is accompanied by slight variations that may be detected by the accustomed ear. The elements with variations were shown by means of lantern slides and the phonograph. Dr. Kroeber's studies included the Mohave Yelak, a myth told in song (25 songs), the Mohave Nyohaiva (6 songs) and the Mohave Raven (4 songs). He also gave by way of comparison a Kwakiutl song, a Yurok Deerskin Dance Song and a Yuki Creator Song.

The address of Dr. George Grant MacCurdy, retiring vice-president of Section H, was on 'Some Phases of Prehistoric Archeology.' Two phases only were discussed—the *eolithic question* and *paleolithic mural decorations*. This address has already appeared in SCIENCE.[3]

[3] January 25, 1907, pp. 125–139.

The program was arranged so as to group related subjects in a single session. One session, for example, included only papers on Folk-Lore, the president of the Folk-Lore Society presiding. At another papers of interest to students of economic and social sciences were read, the members of Section I being present and taking part. The Saturday afternoon program was devoted to the reports of standing committees and was of unusual interest to professional anthropologists.

Brief abstracts of the papers read are given in so far as material at the disposal of the secretary will permit.

Dr. C. Hart Merriam read three papers: 'Totemism in California,' 'The Yummĕ or Mourning Ceremony of the Mé-wuk' and 'Mé-wuk Myths.' That totemism exists in California seems to have escaped the notice of ethnologists. It is in reality quite general. Totems are chiefly animal. They are rarely natural objects. Among certain tribes the totem governs marriage. In the northern division of the Mé-wuk it has a marked influence over the individual. The means by which the individual is led to recognize his totem was given in detail. Dr. Merriam described under three heads the annual mourning ceremony of the Mé-wuk which he saw on October 10 and 11, 1906, illustrating by means of diagrams the round house in which the ceremony occurred. The last paper by Dr. Merriam was a description of certain myths of the Mé-wuk Indians in which the coyote, bear, deer, lizard, mouse, condor, turkey-buzzard, robin, sand-hill crane and other animals played a prominent part.

Dr. Clark Wissler presented some 'Notes on the Blackfoot Myths.'

The myths of the Blackfoot are classified under the following heads:

1. Old Man Series.
2. Culture Hero.
3. Ritualistic Origin Myths.

4. Moral and Entertainment Tales.

A comparison of the myths of these groups with the published mythologies of the Arapaho and Crow indicates a very close relation between the mythologies of the Arapaho and the Blackfoot. Of eighteen myths in the Old Man Series, eleven have direct parallels among the Arapaho and five among the Crow. Of twenty-seven moral and entertainment tales, ten have direct parallels among the Arapaho and two among the Crow. Of fourteen culture hero tales, four have direct parallels among the Arapaho. Thus, out of fifty-nine tales, twenty-four were directly parallel to Arapaho and seven to Crow tales. All the ritualistic origin myths seem to be peculiar to the Blackfoot, and may be regarded as their own contribution to their mythology.

Mr. Edward Sapir's 'Notes on the Takelma Indians of southwestern Oregon' are to be published in the *American Anthropologist;* while Mr. Frank G. Speck's 'Notes on Chickasaw Ethnology' are to appear in the *Journal of American Folk-Lore.* Mr. Speck read a second paper, entitled 'Outlines of Culture in the Southeastern States.'

In her 'Report on the Book on Maryland Folk-Lore,' Miss Anne Weston Whitney gave extracts from the material that is to form a forthcoming volume of memoirs of the American Folk-Lore Society. The compilation of the memoirs has been assigned to various members of the Baltimore Branch. Negro folk-lore predominates—witchcraft, death, hoodoo, conjuring, spells, etc., and the beliefs connected therewith, comparison being made between negro folk-lore of Maryland and that of negroes elsewhere, as Jamaica and Africa.

Mr. Stansbury Hagar's paper on 'Cherokee Star Lore' is to be printed in the *American Anthropologist.*

'Philippine Märchen' was the topic chosen by Mr. W. W. Newell, who spoke of an interesting collection of material that came to him from various sources in the Philippines. Though interesting, the derivation is largely European, especially Spanish.

'Recent Activity in Folk-Lore in Missouri' was one of the themes discussed by Professor W J McGee. He said that a branch of the American Folk-Lore Society had just been organized in Missouri, largely at the instance of Dr. A. L. Kroeber and through the energy of Professor H. M. Belden, of the University of Missouri. The members and officers are drawn from different sections of the state, especially Columbia, St. Louis and Kansas City; the headquarters will be in Columbia at the state university. It is the purpose of the organization to record existing traces of aboriginal lore in conjunction with the English, German, French and Spanish folk-lore which are interestingly combined in the remarkably composite population of the state.

In 'Notes on Puebloan House Construction,' by Mr. Frederick S. Dellenbaugh, the query was made as to how far house construction alone could be depended on in tribal or race classification. By itself the house frequently gave small indication of culture or race affiliation. The Icelander, of purely European ancestry, exhibited in his houses none of the architectural skill of his race. Conditions were against it. A turf or peat house was the easiest thing for him to build. The Iroquois made a flimsy bark house, yet ranked high in culture. Conditions favored bark construction. In the southwest conditions forced other, more permanent forms, from all peoples. There gypsiferous clays and stone slabs were at hand everywhere; bark was scarce. Different people, therefore, may build in the same way, while similar people

may build in different ways. Without other evidence, house construction is an uncertain guide. Sites, too, were chosen for physiographic reasons and site can not be used as a gauge for race or tribe. Because houses and villages were built in cliffs, we can not deduce a race of cliff-dwellers, any more than we can deduce a particular race of forest-dwellers because we find houses in the woods. House construction and house site in themselves indicate no racial differences, or even cultural differences. An otherwise advanced tribe is sometimes prevented from constructing permanent houses by superstition, as the Navajos, who would not live in a house where a death has occurred.

The Colorado River seems to be a line of demarkation between villages of the terraced many-roomed village and the one-story few-roomed type. Here is perhaps a suggestion that the Apache and Ute entered the country from the north, driving the sedentary groups before them. The canyons of the Colorado then were utilized by the latter to hold the roving tribes at bay. Indications of fortifications are found at all fords and passes.

Puebloan houses seem sometimes to have been built to imitate the site, as in the case of the village of Wolpi, where the breaks and angles of the cliffs on which it stands are reproduced in the walls till at a little distance it is difficult to separate the natural from the artificial.

Puebloan construction was mainly of two materials: stone and clay. The stone was (1) *slabs,* (2) *blocks.* These were laid generally with clay mortar, but sometimes there was no mortar, and the stones were put together so neatly as to look like a fine mosaic. Where mortar was used the wall was frequently plastered outside with clay and sometimes whitewashed.

The clay construction was of, at least, five kinds: (1) *Adobe bricks,* either round balls or the ordinary block form so well known. Clay mortar was used. (2) *Cajon,* a form of ramming wet clay into frames. (3) *Single wattle,* plastered on one or on both sides. (4) *Double wattle* with wet clay rammed between. (5) *Jacal,* a wall of upright stakes or rods, plastered with clay on one or both sides. This last construction was also in use east of the Mississippi. In some early Puebloan construction the jacal was used for upper stories, while the lower were of adobe bricks or of stone.

Physiography controls house construction more than does race or culture. In addition there are the factors of daily habit and superstition. The Lapps, after centuries of close contact with a highly developed people, still dress in their primitive way and live in lodges covered with earth.

In 'The Archeology of Manabi, Ecuador' and 'Notes on the Andean Cultures' Professor Marshall H. Saville gave an interesting account of a successful expedition to those regions. He obtained an unrivaled collection of so-called stone seats from the environs of Monte Cristo in the coast region of Manabi. The entire absence of stone implements except hammer-stones was noted. Objects of copper are also rare. There are very few ruins in Ecuador, this being especially true of Manabi. In the interior or Andean region only two ruins are known. The present language here is Quichua, but Inca influence is very slight on the archeology of the district. As one goes north the Inca influence becomes less and less apparent. Most of the antiquities found in the Andean district came from near Rio Bamba. Many fine examples of pottery decorated by the so-called lost color process that characterizes a certain group of Chiriquian pottery as described by Holmes were obtained at Rio

Bamba. This ware is also found in northern Ecuador and southern Columbia. The valuable collections made by Professor Saville belong to Mr. George G. Heye, of New York, who bore the expenses of the expedition. The report on Manabi will be published privately very soon.

In 'Notes on the Occurrence of the Mineral Utahlite as a Prehistoric Gem,' Professor Henry Montgomery described the mineral as a hydrous phosphate of aluminum somewhat similar to turquoise and capable of being highly polished. Although rare, its occurrence has been noted in certain prehistoric ruins.

Mr. Edgar L. Hewett's two papers were on 'The Art of Glazing among the Ancient Pueblos' and 'The Relation of Pueblo Indians of the Rio Grande Valley to the Ancient Cliff Dwellers of the Adjacent Plateaus.' As regards the art of glazing in pre-Columbian times, so many specimens have been found that they can not be considered as intrusive. The ruins in question are certainly pre-Spanish. The glaze has been examined by Washington chemists and found to be saline. It may have originated accidentally about salt works. Immediate firing after applying a saturated solution would produce the glaze, which seems to have been used for decorative purposes solely. The Jemez Plateau is the chief center for glazed ware. Mr. Hewett's second paper is printed in *The American Anthropologist*.

'Recent Archeologic Work in Missouri' was the title of Dr. W J McGee's second paper. During 1905 Mr. D. I. Bushnell, of St. Louis, with two or three associates explored certain mounds on the Illinois side of the Mississippi which yielded abundant relics described in a special publication; later in the season the same gentleman had a number of additional mounds, also in Illinois, excavated by Mr. Gerard Fowke, who found moderately abundant relics not yet fully described. During the summer of 1906 Dr. C. A. Peterson, president of the Missouri Historical Society, with several members of the association (including the writer) made a number of archeologic reconnaissances in both Missouri and Illinois, in the course of which certain caves and mounds were examined—one of the trips being to an alleged aboriginal mound larger than Cahokia or Etowah, near Mascoutah, Illinois, which was found to be a paha with a few small earthworks on its summit. The most noteworthy event of the year was the creation of the St. Louis Society of the Archeological Institute of America with W. K. Bixby as president and Professor F. W. Shipley as secretary, which resulted in the commencement of a systematic survey of the antiquities of the state. Under the auspices of this society (including a subsidy from the institute and a special contribution by President Bixby), Mr. Gerard Fowke reconnoitered the lower valleys of the Gasconade and Osage with a portion of the valley of the Missouri in the central part of the state—the territory comprising what may be known as the Osage district; subsequently detailed surveys were made and over sixty mounds were excavated. In general the mounds are poor in artifacts though rich in much-decomposed osseous remains; the most notable type of artifact is represented by vaults or chambers of well-laid stone, found in a number of mounds.

Professor George H. Perkins showed a number of specimens to illustrate his paper on 'Pottery and Bone Objects found in Vermont.' Entire jars have very rarely been found in New England, and of the half dozen or so which are now in existence the three largest and finest were found in Vermont and are in the museum of the university at Burlington. Photographs of

the most recently found specimen were shown. This is ten inches high, hexagonal at rim, globular below, decorated in the usual manner of Vermont pottery by indented figures and lines over the entire upper portion. It holds twelve quarts. Numerous fragments of highly decorated rims have also been found recently at what appears to have been a camp site, on Mallett's Bay, the largest of the numerous bays of Lake Champlain. At this same locality, in a stiff clay which underlies the loose surface soil many bone awls, scrapers, etc., have been found within the last two months. These objects are interesting in themselves, but they are especially so, as they are the first bone objects found in Vermont, with the exception of one or two which were obtained some years ago at another locality. Marine shells and bits of coral have also been found with these bone objects.

In 'Recent Geological Changes as Affecting Theories of Man's Development,' Professor G. Frederick Wright characterized the Tertiary as a period of stability and the Quaternary as one of great and rapid changes.

'Harness Mound Explorations' was the subject discussed by Mr. William C. Mills. The Harness Mound was opened in 1846 by Squier and Davis and again in 1885 by Professor F. W. Putnam. In these earlier explorations fifty burials were uncovered. Mills has recently found 133 additional burials. Cremation was quite generally practised. In cases where cremation took place at the grave no artifacts were found with the remains, but where cremation had taken place prior to the deposition of the remains, artifacts accompanied the latter. Mr. Mills discovered a series of post-holes surrounding the burials. Long awls made of the leg bone of the deer were described and differences noted between the bone implements from the Harness Mound and those found at Fort Ancient.

Mr. Alanson Skinner gave the results of his 'Recent Discoveries at a Prehistoric Indian Village Site at Mariner's Harbor, Staten Island.' In the spring of 1903 recent railroad excavations at Mariner's Harbor, Staten Island, N. Y., exposed a prehistoric site of the Hackensack Indians, a local branch of the Leni Lenape. Shell pits and burials were found, and up to the spring of 1906 these were opened whenever exposed and many skeletons were found. Pottery was abundant, and this, usually in Algonkin style, often showed Iroquoian influence. Grooved axes occurred, but no celts, and no implements were found with burials.

Saturday morning's program being of interest to students of social and economic science, members of Section I accepted an invitation to be present and take part. Professor Franz Boas opened the session with a paper on 'Heredity in Head Form.' Dr. Robert Bennett Bean followed with 'Some Racial Peculiarities of the Negro Brain,' it being a résumé of his studies recently published in the *American Journal of Anatomy*.[4] In 'Brain and Education,' Dr. Thomas M. Balliet traced the development of the sensory, motor and association centers.

'Selection and Elimination by Immigration' was discussed by Dr. Maurice Fishberg. From available data, collected during the enrollment of soldiers for the civil war, it appears that immigrants to the United States are, on the average, taller than the people in the countries from which they come. It was found that natives of England, Scotland, Ireland, Germany, France, etc., were, on the average, about one inch taller than the soldiers in armies of the countries of their birth. Not only were the immigrants from foreign coun-

[4] September 1, 1906, pp. 353–432.

tries superior to their compatriots at home, but native Americans who enrolled in other than their native states, were on the average taller than those who enrolled in their native states. Measurement taken by the author showed that the Jewish immigrants to the United States are also taller than their co-religionists in eastern Europe. While there are no definite measurements, still it appears superficially that the Italian and Slavonian immigrants are also a selected class physically. This phenomenon is deserving of careful study by anthropologists. It has been attributed to 'social selection' or selection by immigration, and is said to be due to the fact that it is generally the stronger, the more energetic and adventurous who venture to leave the country of their birth, their friends and relatives and travel thousands of miles in search of a possible improvement of their condition. The diseased, the weakly and the defective lack the amount of courage and perseverance necessary to undertake a long journey with small funds.

Not all those who come to the United States remain here. Over twenty per cent. of all the immigrants return sooner or later to their native countries. The author observed that most of those who return to their homes are individuals who, by reason of some physical or mental peculiarity, could not adapt themselves to the conditions in the United States. On the whole, there appears to be going on a process of elimination of many of those immigrants, who for various reasons, are unable to gain a foothold in their new homes. Among those who are compelled to return to Europe—and there are said to be about 300,000 returning annually in the steerage—there are many who would be classed as undesirable immigrants by the immigration authorities, but who in some manner passed through the inspection at Ellis Island. Our social, political and industrial conditions eliminated all these sooner or later.

'Certain Aspects of Human Heredity,' the third paper to be presented by Dr. W J McGee, closed the morning's program. Among the Ainu of Japan (of whom a group participated in the Universal Exposition of 1904) two fairly distinct ethnic types prevail, dividing—so far as known—on lines of sex; the males being of Caucasian aspect in color, pelage, features, stature, etc., while the females approach the Malayan type. Among the Cocopa Indians of the Lower Colorado there is a notable variability in stature, ordinarily divided on sex lines, the males ranking among the tallest and the females among the shortest of the North American tribes; in this respect contrasting strongly, *e. g.*, with the Pueblo peoples, among whom both sexes are below, and the Seri Indians, among whom both sexes are above the medium stature. These and other phenomena lead to a consideration of hereditary tendencies of which some incline either to 'regression toward mediocrity' as shown by Galton or 'reversion to type' as shown by Mendel, while others appear to incline toward increasing and even cumulative variability in special characteristics.

At the afternoon session of Saturday, reports of certain standing committees were read. The report of Professor Franz Boas for the committee on the concordance of American mythologies was adopted, with the recommendation that the committee be continued with power to publish.

Dr. Charles Peabody reported for the Committee on American Archeological Nomenclature. The committee was empowered to print Dr. Peabody's report in full and distribute copies to members of the association in order to form a basis for discussion and final action.

A similar disposition was made of Mr.

F. W. Hodge's report for the Committee on Nomenclature of Indian Linguistic Families North of Mexico. Mr. Hodge also reported for the Committee on Book Reviews. The conditions in regard to book reviews are improving. The present policy is to ask the reviewer in advance of sending the book; but reviews are not always furnished promptly. It was suggested by Professor Boas that a book be published by title immediately giving the scope of the work, a more extended review to follow later if desirable. The report was adopted and the committee continued.

Mr. Edgar L. Hewett spoke for the Committee on the Preservation of American Antiquities. He reviewed the new law, which seems to have been not only highly satisfactory but also administered to the letter. No permits under the law have been granted pending the adoption of uniform regulations, the making of which are entrusted to a committee. The announcement of regulations is expected soon. The president has already created the Petrified Forest National Park and also certain national monuments, such as Devil's Rock, El Morro and Casa Montezuma. Mr. Hewett reviewed the bill creating the Mesa Verde National Park. The report was adopted and the committee continued with power to observe the operations of the law; to represent archeologists in the interpretation of the law; to place before the proper authorities information as to desirable sites to be preserved; to facilitate applications for permits to excavate, etc., and to act as a joint committee with the committee from the Archeological Institute of America.

A resolution was passed to the effect that no distinction should be made between foreign and domestic institutions relative to permits for excavations.

Monday's program opened with an account by Dr. A. L. Kroeber of 'Recent Results of Anthropologic Investigations by the University of California.' The department of anthropology at the University of California is only six years old and owes much to the generosity of Mrs. Phebe Hearst. Its object is threefold: (1) the formation of collections, (2) publication and (3) instruction. The department has undertaken two surveys of California, one being anthropological and ethnological and the other archeological. In discussing the latter reference was made to two papers recently published by Professors F. W. Putnam and J. C. Merriam in the *American Anthropologist*.[5] Dr. Kroeber also referred to the discovery of a Quaternary cave in a new region and to the numerous shell mounds on the Bay of San Francisco, probably one hundred in all. Only a few of these have been explored. In some instances the lowest shell deposits are below the level of the sea.

The ethnological survey is to cover the whole state. Among the special researches may be mentioned Dr. Dixon's work on a linguistic stock that is fast disappearing. In studying the three distinct culture regions special attention is given to environmental differences.

Additional evidence of anthropological activity in California came in the form of a paper by Miss Constance Goddard DuBois on 'The Sandpainting among the Luiseños and Diegueños Mission Indians of Southern California,' which is to be published in bulletin form by the University of California. The sandpainting forms an integral and important part of some of the chief ceremonials of the religion of Chung-itch-nish, which religion was first described by Boscana in 1825, and has remained almost unknown since his day. It came to the mountain Indians of San Diego County from the coast Indians, and

[5] April–June, 1906, pp. 221–235.

to them from the islands of the ocean. Since it was given later by the Luiseños to their neighbors the Diegueños, the religious ritual in both tribes is the same. The sandpainting is therefore found in both; but has been most fully described among the Luiseños.

It was used in Mah-ne, the initiation ceremony for boys when the Datura juice mixed with water was drunk from the sacred stone bowl; in Wu-kún-ish, the girls' *fiesta;* in Ah-nut, the ant-ordeal; and in Ú-nish Ma-tá-kish, the ceremony for burying the feather head-dress, etc., belonging to a toloache initiate after his death. A central hole was dug, and the sand removed from it was used to make a heaped-up circle of a size varying in the different ceremonies. This was painted by sprinkling with powdered paints, the outer edge white; the middle, red; the inner edge black; which circles signified the Milky Way, the Sky and the Spirit of man, the Indian words all meaning spirit; the Milky Way being the Spirit to which the spirits of men go at death.

Three included rows of nine points each in succession make a geometrical figure colored in the same order, white, red and black; and the circle about the hole is similarly painted.

Small heaps of sand in several divisions have each a special significance. The whole of the sandpainting represents the earth. The sky arching above it is supposed to rest upon the circle of the Milky Way. There is a door to the north to allow of escape of the spirit after death.

The candidate in all the ceremonies mentioned except the last, knelt before the sandpainting facing the north with arms extended and a hand placed on the ground on either side of the painting, and spit into the central hole a lump of sage seed mixed with salt which signified the conclusion of a period of fasting. The hole was then filled by carefully sweeping the sand from the circumference towards it, thus obliterating the painting and ending the ceremony.

Mr. Charles H. Hawes, as guest of the American Anthropological Association, presented some very interesting 'Notes on Cretan Anthropology.' In 1903 Dr. Duckworth, of Cambridge University (Eng.), measured 85 Cretan crania belonging to the Bronze Age and 200 living subjects. In 1905 Mr. Hawes added records of 11 ancient skulls and 1,440 living Cretans, making on the latter about 29,000 measurements and observations.

The data for prehistoric times gives an average *cranial* index (for 62 ♂) of 73.4 and an estimated stature of 1,625 mm., with a dolichocephalic percentage of 65.3 and a brachycephalic of only 8.5. From these and the archeological evidence of a non-Aryan culture, we conclude that prehistoric Crete, like neighboring lands, was peopled by a branch of the 'Mediterranean race.'

But a brachycephalic minority existed even in the earliest period of the Bronze age, and the writer inclined to attribute this to an infiltration from the Anatolian highlands, of a people in the Neolithic stage, whether the so-called 'Hittites' or stragglers of the 'Alpine race.'

The records on living Cretans yield an average *cephalic* index (for 1,605 ♂) of 79.2 and stature of 1,686 mm., with a dolichocephalic percentage of only 12 and a brachycephalic of 36.9.

This broadening of the head and increase in stature is attributed to immigration. A marked increase of brachycephalism is noticeable towards the end of the bronze age and this tallies with the tradition of an invasion from the north of the Achæans and Dorians.

Both tendencies owed something to the Venetian occupation, but more to the

Turkish of the last 250 years. Although the Cretan Mussulmans are mainly of native extraction and include only a small minority of Turkish half-breeds, yet their cephalic index is (79.9) a unit higher than that of Christians (78.9) in the same provinces.

The tendency from Neolithic times, to increasing brachycephalism in Crete has a parallel in Italy and Greece, where the greater immigrations of northern peoples have produced the same phenomenon in a more marked degree.

Dr. Berthold Laufer made 'A Plea for the Study of the History of Medicine and the Natural Sciences.' A museum of the history of medicine from prehistoric times to the present would be of special importance. Such a museum should include the medical lore of the Indians. Reference was made to the two professorships of the history of medicine in the University of Berlin.

The paper by Dr. K. S. Kennard on 'Ellis Island as a Field for Anthropological Study,' dealt with the large quantity and variety of material presented at this station. The ease and rapidity with which it could be examined at this point would save delay and expense in accumulating data. Over four million aliens in the last six years had entered this port—comprising those nations which had been but scantily examined anthropologically—namely, the Magyars, people of the Balkan states and Hebrews.

Anomalies of head forms were witnessed among the southern Italians, who are generally believed to be a long-headed people. These unusual head forms resembled that of the Armenians. This was believed to be a racial trait—not an artificial product. The stature of Neapolitan women being greater than that of the men was noted, but could not be explained, also the lighter pigmentation of their eyes. Opportunities for study in folk-lore, linguistics and elementary music of these people were here offered. Advantage should be taken to make use of all this material, for nowhere else in the world could it be effected with so little expense and such complete results.

Dr. K. D. Jessen discussed 'Geometrical Design in Primitive Decoration.' Although Ernest Grosse, in his discussion of the so-called geometrical decorative design found among primitive races, argues convincingly for the original imitative character of it, this view is not at all, it seems, universally accepted. The paper tries to show that the geometric design is, by origin, of an imitative character, naturalistic, not imaginative, esthetically speaking, representing objects or phenomena found in nature or made by culture. It is conventionalized just as the later botanical design becomes conventional, the imitative origin of which no one can deny. The facts, as represented by ethnological observation corroborated by the facts concerning the beginnings of art in the child, are best explained by Grosse's theory. In fact any other theory would involve a most extraordinary break in the evolution of the human mind and would have to be excluded, perhaps, logically, under the law of contradiction..

Miss H. Newell Wardle's communication was on a kindred topic—'Studies in the Life History of Primitive Art.' The art of primitive man was, at its inception, bound by no laws, governed by naught save size and contour of the object whereon he wrought. It was realistic. With the invention of basketry, geometric figures were introduced. The discovery of pottery furnished a new field for the growth of the esthetic sense. The clay vessel inherited the geometric decoration from its predecessor, the basket, but ornamentation of pottery was by means of incising and painting, and these, more ancient than the textile arts, came unbiased to the clay of

the new field. Realistic and geometric decoration upon pottery of necessity reacted upon each other, tending to produce angularities in the former, and scrolls in the latter. The predominance of either form in the art of a people depends not so much upon culture level as upon the peculiar genius of that people. Geometric designs degenerate in two ways; by complication—the reduplication of parts and addition of apparently meaningless flourishes; and by simplification to some striking characteristic—the law of essentials in primitive art.

For primitive man, the world around was filled with sentient beings. Of these he made his gods. Their symbols were, of necessity, life-forms. The life-form passes into the geometrical, and this, with the growth of philosophic and religious thought, is reinterpreted or degenerates into meaningless ornament. A good example is the swastika. The origin, meaning and decay of the symbol were fully discussed.

Professor William P. Blake described an 'Aboriginal Race Course.' In the southern portion of Yavapai County, Arizona, at Peeples Valley, not far from the rancho of Coles Bushford there is a remarkable paved way, race course or stadium of unknown but undoubtedly aboriginal origin. It is in the form of an ellipse some hundreds of feet in major length, and is paved with rough blocks of granite of irregular form for the full breadth of the roadway, about a rod, as nearly as I can now remember. This way is bordered on each side by large outlying boulders of gray granite now partially overgrown by live-oak trees. The largest of these boulders would appear to have been convenient for spectators, but were probably placed by nature along the borders of the two adjoining and nearly parallel water courses, now dry.

It may be supposed that this paved way was designed and used for foot-races. It appears to be worthy of measurements and a map.

The closing number on the program was a communication from Professor E. H. Barbour on 'The Nebraska Loess Man,' presented by Professor Henry B. Ward. The discovery in question was made by Mr. Robert F. Gilder in October, 1906, on Long's hill facing the Missouri River, ten miles north of Omaha. Long's hill stands 200 feet above the river. It is a hill of erosion and no discoverable land slip has complicated its simple geology. On its summit is Gilder's mound, in the superficial layer of which were found mound-builder remains, and in the deep layer eight skulls and many bones of a still more primitive type. According to Professor Barbour, there is evidence of burial in case of the upper bone layer, but none in case of the lower. The bones found in the undisturbed loess doubtless antedate the hill itself. The loess in question rests on Kansan drift, and though as young as the later Wisconsin sheet or younger, it is nevertheless old. A more extended account may be found in SCIENCE for January 18, 1907; and in the Nebraska Geological Survey, volume II., Part 5.

Papers were read by title as follows:

DR. NICOLAS LEÓN: 'Foc-Lor Mexicano.'

MRS. R. F. HERRICK: (*a*) 'The Volcano of Bell Springs'; (*b*) 'On the Preparation of Bone for Certain Implements.'

MR. WILLIAM NELSON: (*a*) 'Witchcraft in Northern New Jersey in the Nineteenth Century'; (*b*) 'The Use of Water Witches in Railroad Building.'

DR. A. M. TOZZER: 'Maya Religion.'

DR. GEO. F. KUNZ: 'On the Aboriginal Use of Turquoise on the American Continent.'

DR. ALES HRDLICKA: 'Racial Characteristics of the Humerus.'

MAJOR C. E. WOODRUFF: 'The Disappearance of Blond Types from the American Population.'

MR. JAMES MOONEY: 'The Decrease of the Indian Population.'

MR. S. P. VERNER: (*a*) 'Iron and Copper Metal-

lurgy in the Kasai'; (*b*) 'The Pygmies and the Anthropoid Apes'; (*c*) 'Phallic Influence in Bantu Art and Mythology.'

COL. PAUL BECKWITH: 'The French-Egyptian Medal in Commemoration of the Savants who accompanied General Bonaparte into Egypt.'

DR. ALTON H. THOMPSON: 'The Ethnology of the Teeth.'

DR. CYRUS THOMAS: 'Some Suggestions in regard to Primary Indian Migrations in North America.'

DR. SAMUEL S. LAWS: (*a*) 'The Physiology of Second Sight'; (*b*) 'A Main Factor in remedying Deafness'; (*c*) 'The True Object of Vision.'

GEORGE GRANT MACCURDY,
Secretary

YALE UNIVERSITY

SCIENTIFIC BOOKS

The Evolution of Culture and Other Essays. By the late Lt.-Gen. A. LANE FOX PITT-RIVERS, D.C.L., F.R.S., F.S.A. Edited by J. L. MYRES, M.A., Student in Christ Church, Oxford; with an introduction by HENRY BALFOUR, M.A., Fellow of Exeter College, Oxford, Curator of the Pitt-Rivers Museum. Oxford, Clarendon Press. 1906. Pp. 232; 21 pls. 8vo. 7s 6d net.

Here you have together, in attractive form, the principal writings of one of the pioneers in culture-history, or the story of mankind recorded in the works of their hands. The volume includes: Principles of Classification (1874), On the Evolution of Culture (1875), Primitive Warfare (1867, 1868, 1869), three chapters, Early Modes of Navigation.

Two loving disciples have prepared the volume and written the introduction. Precise references have been identified and given in full, and obvious errors in the text have been either amended or corrected in a foot-note. The volume was prepared to supply the needs of candidates for the Oxford diploma in anthropology and of the numerous visitors to the Pitt-Rivers Museum, in Oxford; but every student of culture will feel happier with a copy at hand.

Colonel Fox's text was that in the arts and customs of the still living savage and barbaric peoples there are reflected to a considerable extent the various strata of human culture in the past, and that it is possible to reconstruct in some degree the life and industries of man in prehistoric times by a study of existing races in corresponding stages of civilization. Professor Balfour wisely says: "The fact of our not agreeing with all his details in no way invalidates the general principles which he urged." In all our best museums the exhibits that attract the most people and interest those in every walk of life are the synoptic series, easily leading the mind from a shadow in the snow to the chronometer; from a bow and arrow to the latest carbine; from Triton's horn to the cornet; from a woman's back to the express train; from a raft to the gorgeous ocean steamer. O. T. M.

March 30, 1907

Organische Zweckmässigkeit, Entwicklung und Vererbung vom Standpunkt der Physiologie. Von Dr. PAUL JENSEN, Professor an der Universität Breslau. Pp. 251. Jena, G. Fischer.

Dr. Jensen has attempted to state some of the general and fundamental problems of biology — adaptiveness, heredity, evolution, variation, selection, and the like—from a purely physiological standpoint, and to indicate the lines along which physiology would lead us to look for a solution. The result will be found most interesting and suggestive to those working along these lines. The processes taking place in development, individual as well as racial, are occurring in the same complex of material as are the processes of (for example) metabolism. They are as much a part of a proper science of physiology as are the latter. Further, there seems to be no reason why physiology should proceed on essentially different principles in different cases in the investigation of the various processes with which it deals. This consideration leads the author to a criticism of certain theories which do appear to be based on principles fundamentally different from those which have been found valuable in unravelling the processes commonly assigned to physiology. On the one hand all doctrines which attribute the characteristics of organisms, hereditary and otherwise, to certain

units, as *ids, biophors, micellæ,* and the like, are arraigned as not in accordance with the tendency of modern physical chemistry, which physiology has found so illuminating in its application to the organic processes. Many of the modern ideas of chromosome significance are included in this criticism, which is certainly one that deserves careful consideration. On the other hand such vitalistic doctrines as that of Driesch's entelechy are set forth as equally out of the line of progress. Dr. Jensen is a man of broad reading, of judicial mind, and one that has long been known as an investigator in general physiology. To the reviewer his views seem unusually just and well balanced, so that the paper is one to be highly recommended.

In the latter parts of the work Jensen develops a general theory of development, based largely on various manifestations of the selection principle, working on the materials offered by the physico-chemical universe. In such matters tastes will of course differ; to the reviewer it appears that this, like the critical part of the work, is judicious and valuable.

The present paper is preliminary to an extensive work dealing with general physiology. If the whole is maintained at the high level shown in the preliminary part, its appearance may be looked for with great interest.

H. S. Jennings

SOCIETIES AND ACADEMIES

THE NATIONAL ACADEMY OF SCIENCES

At the meeting of the National Academy of Sciences beginning on April 16, the following papers were presented:

W. T. Swingle and Lyman J. Briggs (introduced by C. Hart Merriam): 'Utilization of Ultra-violet Rays in Microscopy,' and demonstration of the apparatus employed (with lantern illustrations).

Karl F. Kellerman (introduced by Theo. Gill): 'On the Purification of the Isthmian Potable Water Supply' (with lantern illustrations).

J. W. Gidley (introduced by C. D. Walcott): 'A New Horned Rodent from the Miocene of Kansas' (with lantern illustrations).

F. H. Knowlton (introduced by Arnold Hague): 'The Laramie Problem.'

David White (introduced by W. H. Dall): 'Permo-Carboniferous Climatic Changes in South America.'

F. W. True (introduced by W. H. Dall): 'On the Occurrence of European Genera of Fossil Cetacea in America.' (By title.)

J. M. Crafts: 'A New and More Accurate Form of Normal Barometer.'

J. M. Crafts: 'The Catalysis of Sulphonic Acids in Concentrated Solutions.'

F. H. Bigelow (introduced by Cleveland Abbe): 'A Solution of the Vortices in the Atmospheres of the Earth and the Sun' (with lantern illustrations).

L. A. Bauer (introduced by S. Newcomb): 'Results thus far obtained by the Oceanic Magnetic Survey of the Carnegie Institution of Washington, and their Bearing' (with lantern illustrations).

Richard B. Moore (introduced by Arnold Hague): 'The Relation of Radium to Hot Spring and Geyser Action' (with lantern illustrations).

Henry F. Osborn: 'Exploration in the Upper Eocene of the Fayoum Desert' (with lantern illustrations). (By title.)

Lewis Boss: 'Remarks on the Solar Motion' (with lantern illustrations).

Horace L. Wells: 'Biographical Memoir of Samuel L. Penfield.' (By title.)

A. L. Day (introduced by Geo. F. Becker): 'Some New Measurements with the Gas Thermometer.'

Simon Newcomb: 'On the Optical Principles involved in the Interpretation of the Canals of Mars.'

Simon Newcomb: 'Methods of Detecting Correlations between the Variations of Fluctuating Quantities, with an Application to the Question of the Variability of the Sun's Radiation.'

W. W. Campbell: 'The D. D. Mills Expedition to the Southern Hemisphere' (with lantern illustrations).

C. D. Perrine (introduced by W. W. Campbell): 'Results of the Intramercurial Planet Search.'

Alexander Agassiz 'The Eggs of Flying Fishes.' (By title.)

Alexander Agassiz: 'The Elevated Reefs of the Windward Islands.' (By title.)

E. W. Hilgard: 'Biographical Memoir of Joseph Le Conte.' (By title.)

Bailey Willis (introduced by Arnold Hague): 'Continental Structure of Asia.'

Wirt Tassin (introduced by W. H. Dall):

'The Occurrence of Elemental Silicon in a Meteoric Iron.'

THE PHILOSOPHICAL SOCIETY OF WASHINGTON

A SPECIAL meeting of the society was held on March 21, 1907, at the U. S. Bureau of Standards, for the purpose of hearing a paper on 'The Determination of the Temperature of the Sun, and Recent Solar Theories,' read, by special request of the society, by Professor Dr. Otto Lummer, of the University of Breslau. An informal reception followed upon the close of Dr. Lummer's discourse.

The 632d regular meeting of the society was held on March 30, 1907, President Hayford in the chair. The first paper of the meeting was presented by Mr. Elliott Woods (read by Mr. Mark A. Woodell at the author's request) upon 'Recreations in Wireless,' the writer introducing his theme with a brief mention of his early laboratory experiments in electricity and a statement of how his attention and interest were first drawn to wireless telegraphy. Some of the characteristics of wireless telegraphy were then described. Wireless telegraphy speaks by means of vibrations impressed upon that assumed substance, the ether, in which case two capacities are electrically charged to a point where the resistance of the air breaks down and a spark passes between the terminals of the capacities when these are suitably disposed according to the potential of the E.M.F. employed. This spark is the seat of the impressing energy on the ether. The waves thus produced proceed in a circular surface formation. The next step is the receipt of these energy waves. It requires that there be some mechanical device which will absorb the incoming energy of the waves and which in its details must vibrate in unison with these incoming oscillations or waves. It was then stated that messages are received in two ways, either by automatic registration on a tape or by ear, receiving the signals by means of the so-called electrolytic receivers.

Two things appear essential for wireless communication, *i. e.*, harmony in wave vibration between source of power with which we impress the energy and the wave period of vibration of the medium upon which our power is impressed to form the waves, *i. e.*, the closed sending circuit and the aerial. These desirable conditions are found by measurements with a specially designed apparatus known as electric wave meters. A brief description was given of the different parts of a wireless equipment, and the uses of the electric wave meter in measuring the vibratory wave-lengths of the two branches of the system to accomplish harmony of relation. In describing the process of receiving the waves it was stated that as aerials vary in length in nearly every case, so their periods of vibration vary, hence 'tuning' must be resorted to if stations at any distance are to be heard. In the course of the author's remarks concerning some of his experiences in the operation of a wireless station it was stated that daylight signals as received were weaker than night signals, and he was inclined to attribute this to the fact of fewer signals being sent at night. Experience also showed that signals could be heard better on cloudy nights than on clear ones. Instances were cited which seemed to indicate that intervening land areas have an effect upon the receiving of messages. Static wave disturbances were discussed as to their general effect, as revealed by the author's experience. One of the conclusions reached by the author in studying the relations of atmospheric conditions to 'wireless conditions' was that there was no doubt in his mind as to the ability of the wireless receiver, aided by the static conditions which it registers, to show even ahead of the barometer the oncoming of a serious change in the weather, even when the sky doesn't indicate such a change. It was the writer's opinion that the greatest field of labor lies in studying the relations of atmospheric conditions to form of waves sent out under present method of wireless transmission. In the concluding remarks of the paper the commercial benefits of wireless telegraphy were briefly noted.

The last paper of the evening was presented by Mr. Asaph Hall, Jr., under title of 'Discussion of some Errors of Meridian Circles.' The introductory remarks included a description of some meridian circles. The principal

idea of the newest instruments is that of reversal so as to eliminate constant errors. Diagrams were exhibited showing the method of determination and the magnitude of errors of graduation of certain English, French and American observatory circles. The mechanical process of graduating these circles was briefly described. The relative merits of the circles of different sizes used were discussed and it was stated that the tendency is towards smaller circles, one of the advantages of which is possibly that the smaller circles are easier to cast and to graduate than the large ones with which some observatories had been equipped. It was stated, as a general conclusion, that the division errors of the circles mentioned by the speaker, and shown on the diagrams exhibited, are smaller than one would expect them to be.

R. L. Faris,
Secretary

THE AMERICAN CHEMICAL SOCIETY. NEW YORK SECTION

The sixth regular meeting of the session of 1906–'07 was held at the Chemist's Club, 108 West 55th Street, on April 5.

Dr. C. A. Doremus presented a review of the life of M. Berthelot and showed some interesting pictures and memoirs. Dr. C. S. Palmer added a few remarks regarding Berthelot's work and finally the assembly rose out of respect to his memory.

The following papers were presented:

On the Danger of Over-specialization: L. H. Baekeland.

Some New Double Phosphates of Chromium: L. J. Cohen.

1. The addition of a slight excess of diammonium phosphate to a hydrochloric acid solution of ferric chloride precipitates a double phosphate of iron of the formula $NH_4H_2PO_4 \cdot FePO_4$ which is perfectly white, soluble in mineral acids and readily hydrolyzed by water and ammonia; prolonged boiling with hot ammonia dissolves the salt with the formation of a reddish brown solution from which 95 per cent. alcohol precipitates a basic double phosphate. On ignition, the double salt decomposes, giving off ammonia and water.

2. When aluminum chloride is used instead of iron, a corresponding double phosphate forms of the formula $NH_4H_2PO_4 \cdot AlPO_4$ having the same solubilities as the iron salt, except towards alkalies; in the latter it dissolves completely, behaving like aluminum phosphate.

3. With slightly acid solutions of chromium chloride diammonium phosphate precipitates a double salt of the formula $(NH_4)_2HPO_4 \cdot 2CrPO_4$ possessing a green color and retaining three molecules of water at 98° C.

4. The addition of disodium phosphate to an acetic acid solution of chromium chloride, precipitates a double phosphate of the formula $Na_2HPO_4 \cdot 2CrPO_4$, which retains five molecules of water at 98°, and which is considerably lighter in color than the corresponding ammonium salt.

Reply to Criticisms of Dry Lead Defecation in Raw Sugar Analysis: W. D. Horne.

In clarifying sugar samples for polarization it is customary to add a solution of lead subacetate to remove coloring matter. As the precipitate formed occupies some space within the 100 c.c. to which the solution must be made up before filtering and observing in the polariscope a corresponding concentration of the solution of sugar ensues, causing the polarization to be too high, in proportion to the volume of the precipitate. To obviate this error W. D. Horne proposed that the solution of sugar be made up to the full 100 c.c. before clarifying and then that a powder of anhydrous lead subacetate be carefully added. This has the effect of causing the precipitate formed to lie outside of the 100 c.c., the acetic acid radicle taking up the space within the solution formerly occupied by the organic radicles now combined with the lead. H. and L. Pellet attacked this method, claiming that 1° the lead precipitate absorbed from solution enough sugar to counterbalance the error due to the volume of the precipitate, and 2° the addition of anhydrous lead subacetate dilutes the solution enough to account for the differences of polarization by the ordinary method and by Horne's dry lead defecation.

In this paper Horne shows that the precip-

itate does not absorb sugar, by demonstrating that the ratio of sugar to water is a trifle lower in the unwashed lead precipitate with its adherent sugar solution than it is in the filtrate from the precipitate, while if the adsorption theory were correct a difference of ratio of sugar to water would exist in the other direction and be more than seven times greater than that actually found. The author also shows by analyses of pure sugar solutions to which known quantities of organic matter precipitable by lead were added, that the increase in polarization is strictly in accord with the volume of the precipitate, leaving no room for the claim of absorption.

In regard to the second criticism it is pointed out that analyses of the filtrates after clarification with lead subacetate showed the presence of only very small quantities of lead, which calculated to anhydrous lead subacetate and taking into account the volume which this salt occupies when dissolved, would only have been capable of influencing the results to the extent of 0.044 per cent. and 0.042 per cent. respectively, in two very low test sugars, which are quantities smaller than the allowable analytical error. High test sugars would be influenced even much less.

It is pointed out in conclusion that the critics of the dry defecation method have explained away by their gratuitous assumptions twice as much difference between the old and the new methods as ever can exist, while these later researches of Horne's all go to strengthen the claims he originally made.

C. M. JOYCE,
Secretary

THE AMERICAN CHEMICAL SOCIETY. NORTHEASTERN SECTION

THE seventy-fifth regular meeting of the section was held at the Trade Club, 77 Summer Street, Boston, on Friday evening, March 29, at eight o'clock, President L. A. Olney in the chair. About ninety members and guests were present.

The section was addressed by President Ira Remsen, of the Johns Hopkins University, who gave some 'Reminiscences of Liebig and Wöhler.' Having been a student under both these great leaders, and knowing one of them (Wöhler) rather intimately, President Remsen was able to throw many side-lights upon the characters of them both. While at Münich as a student in Volhard's laboratory in 1867, he attended Liebig's lectures, and the description of Liebig, his pompous personality, his irritable temper and his overbearing attitude towards his assistants and subordinates, his bent towards sensational experiments and striking situations, was most interesting and amusing. Then followed a résumé of Liebig's investigations, his great work in agricultural and physiological chemistry: the question of possible extraction of the essential food principles of meat, and the resulting production of 'Liebig's extract'; the scientific preparation of bread, and the appearance of 'Liebig's bread' in the market; finally his lively controversy with Pasteur, on the subject of fermentation, was most interestingly told. Liebig's greatest work was done in Giessen, in what Dr. Remsen considers the 'greatest school of chemistry the world has ever known.' At Munich he rested largely on his reputation, became a court favorite, and gave much less attention to chemical work.

Through the good offices of Volhard, the speaker was introduced to Wöhler, and as a result soon became one of the latter's students at Göttingen. Wöhler was most emphatically the opposite of Liebig in every way; a small-statured, quiet man, who was very methodical and painstaking and given to very minute explanations of the various phenomena observed in his experiments. He was also a most kindly man in his relations with his family and subordinates. His lectures were elementary as best suited to the needs of his audience, but his investigations were of a high order. For three semesters, the speaker was Wöhler's assistant and took part in the researches on aluminium, silicon, boron, etc., and came to know him very well. Wöhler had but little interest in the theories of Kékulé, who was then exciting a great influence in organic chemistry. Wöhler's home life was ideal and his friendship for Berzelius very strong. Liebig and Wöhler exerted a great influence upon

chemistry during the second and third quarters of the last century.

Following President Remsen's address, short accounts were given of the following honorary members of the society, whose deaths have been recently announced: Mendelejeff, by Professor H. P. Talbot; Roozeboom, by Professor A. A. Noyes; Berthelot, by Professor J. F. Norris; Moissan, by President Remsen.

A vote of thanks was tendered to President Remsen and the other speakers, for the very interesting addresses and the section adjourned at 10:25 P.M. As usual, a light lunch was served immediately after adjournment.

FRANK H. THORP,
Secretary

DISCUSSION AND CORRESPONDENCE

THE MISLEADING AND THE NON-INFORMING TITLE

TO THE EDITOR OF SCIENCE: There is a matter to which frequent reference has doubtless been made in print, but to which I now recall attention.

I allude to (1) 'the misleading title' and (2) 'the non-informing title.'

1. I need give no particular instance. Entomological magazines are full of 'Entomological Notes in Spain,' 'A Trip to Switzerland,' etc., referring actually to Lepidoptera only; or 'Coleoptera from Moray,' to which a list of the Hemiptera captured is added as a foot-note. These are a great nuisance to the specialist.

2. I take as an example, the *Proc. Linn. Soc.: New South Wales* (2), VI., part 3 (1892), not because the publication is alone in its misdemeanor, but because I have just been referring to it.

There are four papers in the 'list of contents' which convey no idea of even to what class they refer, unless one indeed chances to have heard of the forms previously.

(*a*) 'On the synonymy of *Helix* (*Hadra*) *gulosa* Gould.' On the second page (322), 'Conchology' and 'Mollusca' are mentioned.

(*b*) 'Observations on the Chloræmidæ,' etc. Who, but a student of the worms, knows what a chloræmid is? We find no help till the middle of the first page, when it is mentioned as a chætopod and it is quite likely that some specialists do not know what a chætopod is. It is, however, termed an annelid on the fourth page.

(*c*) 'Descriptions of two new species of *Carenum* from West Australia.' I do not think there is anything in the six pages of this paper to inform us to what class *Carenum* belongs, unless by inspection of the horismology used. I presume, from certain words employed, and from the fact that Mr. Sloane is the author, that it is a carabid beetle.

(*d*) 'Description of a new *Diplomorpha*.'

'Shell,' 'Conchology,' etc., are used, informing us that the genus is molluscan.

The above remarks are made on the supposition that the 'Proceedings' are in front of us; but what is the unlucky wight to do who only sees a list of the contents as an advertisement in some other journal?

The instances cited and the countless other similar ones are a disgrace to the authors and editors concerned. The simple method adopted by, *e. g.*, the Entomological Society of France in their *Bulletin*, is now urged. An abbreviation of the order, or orders, concerned is placed in square brackets after the title, thus 'Note sur *Corœbus fasciatus* Vill. = *bifasciatus* Ol. [Col.] et ses parasites [Hym.]'; so that we know at once that this paper deals with Coleoptera and Hymenoptera. This is sufficient for entomological publications; for those of wider scope, the addition of the class would be useful, thus '[Ins. Col.]' or '[Crust. Dec.].'

There are already troubles more than sufficient, in the path of the present-day worker who strives to keep himself informed of the literature of his chosen subject, in the shape of multifariousness of publications and of languages, false dates of publication, false pagination of separata, and so forth, without his being compelled to resort to Scudder and Waterhouse, often only to find that the generic name desired has been employed three or four times, perhaps in different phyla.

G. W. KIRKALDY

THE DISPUTED ERUPTIONS OF VESUVIUS

TO THE EDITOR OF SCIENCE: It occurs to me that two important bibliographical references

omitted by Dr. Eastman in his note upon the disputed eruptions of Vesuvius are L. Riccio, 'Bibliografia della eruzione vesuviana dell'anno 1631,' in *Arch. Stor. Napol.*, XIV., pp. 437 et seq., and the most exhaustive bibliography of Vesuvian eruptions that I know about, that compiled by Herr Furcheim (E. Prass, Naples, 1897). This latter is a work that took many years to complete.

As Professor B. Croce, of Naples, says, the terrible eruption of 1631 produced a great corpus of scientific and poetic literature concerning it. Perhaps the most noted of the literati who treated of it was Giambattista Basile (1575–?–1632) the celebrated author of the Pentameron entitled Lo Cunto de li Cunti, one of the chief monuments of Neapolitan dialect. One of the three sonnets which Basile composed upon the memorable occasion is a masterpiece of poetic visualization:

Con vomero di foco, alto stupore,
Mostruoso arator solca il terreno,
E il seme degl'incendii accoltoal seno
Vi sparge, e'l riga di fervente umore.
E, quindi, a fecondarlo in rapid'hore,
Di cenere ben ampio, ilrende pieno;
Onde, quanto circonda il mar Tirreno,
Messe raccoglie di profondo horrore.
Ma, se danno produce a noi mortali
Cotanto aspro Vesuvio; ond'ogni loco
Arde, nè scampo ei trova in mezzo al verno;
Pur raccoglier ne giova in tanti mali
Dal cener sparso, e dal versato foco,
Membranza de la Morte, e dell'Inferno!

In connection with this topic one ought not to omit mention of the eruption of 1794 as described by the historian and engineer General Colletta in his Storia di Napoli.

T. D. BERGEN
CAMBRIDGE, MASS.

SPECIAL ARTICLES

A PLANT-TUMOR OF BACTERIAL ORIGIN

THE number of vegetable galls known positively, *i. e.*, by exact experiment, to be due to bacteria, is not very great. The discovery of a new one of undoubted bacterial origin is, therefore, of considerable interest to plant pathologists, and may be of some interest to animal pathologists, especially to those interested in determining the origin of cancerous growths.

For two years the writers have been studying a tumor or gall which occurs naturally on the cultivated marguerite, or Paris daisy. It has been difficult to isolate the organism and to demonstrate it unmistakably in stained sections. Recently the bacteria (seen in small numbers in the unstained tissues on the start) have been plated out successfully. With subcultures from poured plate colonies, thus obtained, the galls have been reproduced abundantly and repeatedly during the last few months, the inoculations having been made by needle-pricks. From galls thus produced the organism has been reisolated in pure culture and the disease reproduced, using subcultures from some of the colonies thus obtained and puncturing with the needle as before. More than 300 galls have been produced by puncture inoculations. Under the most favorable conditions (young tissues) the swellings begin to be visible in as short a time as four or five days, and are well developed in a month, but continue to grow for several months, and become an inch or two in diameter.

In some of our experiments one hundred per cent. of the inoculations have given positive results (40 punctures out of 40 in one series; 62 punctures out of 62 in another), while the check plants have remained free from tumors, and also, in nearly every case, the check punctures on the same plant. In the two series just mentioned there were 110 check punctures on the same plants, all of which healed normally and remained free from galls. Old tissues are not very susceptible. The tumors grow rapidly only in young fleshy organs. The organism attacks both roots and shoots. It frequently induces abnormal growths on the wounded parts of young cuttings. Its power to produce hyperplasia is not confined to the marguerite. Well-developed small tumors have been produced in a few weeks on the stems of tobacco, tomato and potato plants and on the roots of sugar beets. More interesting economically is the

fact that galls closely resembling the young stages of crown-gall have been produced on the roots of peach trees by needle-pricks, introducing this organism. In eighteen days these growths have reached the size of small peas, the checks remaining unaffected. It is too early, perhaps, to say positively that the cause of the wide-spread and destructive crown-gall of the peach has been determined by these inoculations, but it looks that way. Of course, the most that can be affirmed absolutely at this writing is that we have found an organism which when inoculated into the peach produces with great regularity galls which in early stages of their growth can not be distinguished from the crown-gall. The matured daisy galls also look astonishingly like the peach gall. Numerous experiments which ought to settle the matter definitely in course of the next three months are now under way. In the best series of experiments on peach roots (that inoculated from a standard nutrient agar culture five days old) 14 groups of needle-punctures (5 in each group) were made on nine trees, 13 tumors resulting. The fourteenth group was on a weak tree which did not leaf out, and might therefore be left out of the count. In that case we have 100 per cent. of infections. On the roots of nine young trees from the same lot, held as checks, 75 punctures were made, using a sterile needle, but no galls resulted. In another series of 9 peach trees inoculated at the same time as the preceding and examined on the twenty-third day, 75 per cent. of the punctures had yielded galls (9 tumors on 7 plants). These roots were inoculated by needle-pricks from a culture believed to be rather too old (glycerin agar streak 6 days), but the plants were set out again, and it is not unlikely that galls will finally develop on the roots of the other two plants. The plants, inoculated and uninoculated, were set, immediately after making the needle-punctures, in good greenhouse soil, in new ten-inch pots, and have been subject to the same conditions as to light, heat and water.

That crown-gall of the peach is due to a myxomycete the writers have never been willing to admit, because the inoculation experiments described by Professor Toumey do not clearly establish such fact. He saw often in the tissues of the galls what he interpreted to be the protoplasm of a slime mold mixed in with the protoplasm of the host plant, and he obtained sparingly what he supposed to be the fruiting bodies of this organism on the cut surface of the galls. He made, however, only two series of inoculations with the spores of his *Dendrophagus globosus,* four trees in the first case and six trees in the second, one developing the disease in the first instance and two in the second. Why did not the other seven trees contract the disease when the spores were thrust into the wounded tissue? He did not fully exclude the possibility that the three infections were due to some other cause accidentally introduced on his needle point. The *Dendrophagus* sporangia furnishing spores for the inoculations grew not on culture media but on the cut surface of a gall (an infectious substance). What if a few bacteria had been carried up from the surface of the gall, contaminating the surface or interior of the sporangia? Then the needle might occasionally have introduced two organisms into the wounds instead of one, as believed, and the unsuspected one might have been the cause of the disease. This supposition is not excluded by any of Professor Toumey's experiments.

The fact remains well established, however, by experiments of various persons: Thaxter, Halsted, Selby, Toumey, Smith, Von Schrenk and Hedgcock, etc., that when minced galls are buried in the earth near the roots of sound trees, the latter develop galls. The disease is therefore a communicable one, but the cause, in spite of much study by many persons, is still in dispute.

For the organism causing these tumors the name *Bacterium tumefaciens* is proposed with the following brief characterization: *B. tumefaciens* n. sp., a schizomycete causing rapid multiplication of the young tissues of *Chrysanthemum frutescens, Prunus persica,* etc., the result being the production of tumors or galls. The organism is motile, especially in young cultures; it is non-gas-forming and aerobic (twelve days) with all of the sugars

and alcohols tried (dextrose, saccharose, lactose, maltose, mannit and glycerin). It is white on standard nutrient agar and potato and in peptonized bouillon. In tubes of bouillon it grows best at the top, producing a stringy ragged rim easily separable on shaking. It does not cloud bouillon heavily. The surface colonies on agar, 25° C., are small, round, smooth and rather dense. In agar streak cultures the organism is inclined to pile up along the track of the needle rather than to spread widely. It is inclined to be viscid on agar, after three days. It gradually blues litmus milk, throwing down the casein by means of a lab ferment, or at least not by the production of any acid, finally the litmus is reduced. It does not liquefy standard nutrient gelatin (fifteen days) and does not grow in the thermostat at blood heat (agar, bouillon). In young agar streak cultures it is a medium-sized, short rod, with rounded ends, often in pairs with a plain constriction, the elements usually being 1μ or less in diameter and two to three times as long as broad. The one to three flagella are polar. It is not yellow on any medium, or green fluorescent, nor does it brown the agar. It is rather short-lived on agar. It does not grow in Cohn's solution and does not infect olive shoots. It occurs principally at the bottom of the tumor rather than uniformly distributed in its tissues. It is best isolated from that part of the stem where the tumor joins the healthy tissues. There are slight indications of metastasis. Non-pathogenic yellow organisms are frequently obtained on plates made from older portions of the galls.

ERWIN F. SMITH,
C. O. TOWNSEND
BUREAU OF PLANT INDUSTRY,
U. S. DEPARTMENT OF AGRICULTURE,
April 4, 1907

NOTES ON ORGANIC CHEMISTRY

CATALYTIC ACTION OF ETHER AND OF TERTIARY BASES ON THE CLAISEN CONDENSATION AND ON THE FORMATION OF GRIGNARD'S REAGENT

SINCE its discovery the Claisen condensation has excited a considerable amount of interest, not only on account of the compounds which can be obtained by its means, but also because of the rather complex changes which attend its progress and which are far from being understood. In its simplest form, the reaction consists of the elimination of one molecule of alcohol from equal molecules of an ester and an aldehyde or ketone, and it proceeds under the influence of sodium or sodium ethylate. Thus, for example, acetone, CH_3COCH_3, and ethyl oxalate, $C_2H_5OCOCOOC_2H_5$, under the conditions mentioned, readily form ethyl acetoneoxalate, $CH_3COCH_2COCOOC_2H_5$, and alcohol, C_2H_5OH.

In the course of some work on which we have been engaged for a number of months, we have found that the Claisen reaction is very greatly accelerated by the addition of small quantities of ether or of a tertiary base, such as pyridine or quinoline, the reacting materials being dissolved in low boiling ligroin. We have shown that this accelerating action is not due to the fact that any of the intermediate sodium compounds have a solubility in such a mixture, materially different, from their solubility in pure ligroin. In short, the ether and the bases act as typical catalytic agents. We believe that these observations put the Claisen reaction in an entirely new light.

About eighteen months ago it was found by Tschelinzeff,[1] that the formation of Grignard's reagent,

$$Mg<\begin{matrix}X\\R\end{matrix},$$

(X = halogen; $R = C_2H_5$, C_6H_5, etc.) is also influenced in the same manner by the presence of ether or of a tertiary base. We have confirmed this result and have made some new observations of our own. There is thus, experimentally, a very striking parallel established between the Claisen condensation and the formation of the Grignard reagent. The object of this note is to call attention to our results, which we think have some general interest. A fuller account of the subject, together with a description of the experiments

[1] *Ber. d. Chem. Ges.*, **37**, 2081, 4534; **38**, 3664 (1905).

which we have made, will be found in a paper published quite recently.[2]

J. Bishop Tingle,
Ernest E. Gorsline
Johns Hopkins University,
Baltimore, Md.,
April, 1907

CURRENT NOTES ON METEOROLOGY AND CLIMATOLOGY

VON BEZOLD, PAULSEN, RUSSELL

Death has claimed three men whose work in meteorology has made their names well known the world over: von Bezold, Paulsen and Russell.

Wilhelm von Bezold died on February 17, 1907. Born in Munich in 1837; Ph.D. of Göttingen; professor at Munich; organizer of the Bavarian Meteorological Service; professor of meteorology at Berlin; director of the Prussian Meteorological Institute at Berlin; his best-known and most important writings concerned meteorology as the physics of the atmosphere. A collection of his contributions to meteorology was published in October, 1906, by Vieweg, of Braunschweig.

Adam F. W. Paulsen (1833–1907) died at Copenhagen on January 11. Physicist; director of the Danish Meteorological Institute; active in organizing and supervising the extended meteorological work of that institute; critical student of the aurora borealis and of the meteorological conditions of Greenland; established permanent telegraphic communication between Iceland and Europe for the transmission of meteorological despatches; member of the International Meteorological Committee.

H. C. Russell died at Sydney, New South Wales. Since 1870 government astronomer and director of the Sydney Observatory; organizer of the New South Wales meteorological service; untiringly enthusiastic in increasing the number of his observers and in publishing the results of their work; fellow of the Royal Society.

SOUNDING THE AIR OVER THE OCEANS

The Prince of Monaco recently addressed the Scottish Geographical Society on 'Meteorological Researches in the High Atmosphere' (*Scot. Geogr. Mag.*, March, 1907), giving a popular account of the work which he has carried on during the past three years in exploring the free air over the oceans by means of kites, captive balloons, *ballons-sondes* and pilot balloons. On his recent expedition to Spitzbergen, the Prince reports that these pilot balloons were followed by means of special theodolites up to an altitude of 82,000 feet at the very least. At the moment one particular balloon disappeared it was at a distance of 49½ miles from the observers. The pilot balloon ascents of 1906 showed that near the 80th parallel north latitude, at a height of 13,600 meters, more or less, there are winds of 132 miles an hour, with a direction S. 68° W.

RAINFALL AND THE SALTON SEA

Professor A. J. Henry (*Monthly Weather Review*, December, 1906) discusses briefly the, at present, very pertinent question of the possible effects of the new Salton Sea on the climate of the surrounding area. The excessive rainfalls of 1905, which have been attributed to the influence of the Salton Sea, are shown to have had nothing to do with that body of water. It is undoubtedly true that the relative humidity in the immediate vicinity has been somewhat increased, but this does not mean that there must be an increase in rainfall.

CLIMATE OF VIRGINIA

In a recent paper on 'Climate and Boundaries of Virginia' (*Bull. Amer. Geogr. Soc.*, February, 1907) G. T. Surface gives a brief account of the climatic features of the state, subdividing into three provinces, tidewater; middle piedmont; and Blue Ridge, valley and Appalachia. The discussion is inadequate so far as giving any very clear picture of the actual conditions is concerned. A table of mean annual temperature, rainfall and snowfall, and length of the growing season (1900–1905) is given for 'representative' stations. We note that in the western districts "the most successful growers plant their orchards on the mountains, because the valleys are not

[2] *Amer. Chem. Jour.*, 37: 483 (1907).

only more subject to frost, but the winter temperature is lower than for the mountains." This is a common result of inversions of temperature, generally noted in mountainous regions everywhere.

RAILROADS AND VEGETATION IN THE TROPICS

ONE of the chief difficulties in the maintenance of way along railroads in the moist tropics is the constant struggle against tropical vegetation. This is also a source of great expense. Along the Tehuantepec Railroad, as pointed out by Dr. E. O. Hovey (*Bull. Amer. Geogr. Soc.*, February, 1907), mechanical means have proved inadequate, although they are still used, and the railroad company has adopted a chemical which is applied, from a tank car, at a high temperature and under pressure, by means of a steam sprayer. This kills the roots, as well as the superficial growth.

NOTES

BULLETIN 59, New Mexico College of Agriculture, by J. D. Tinsley, contains the meteorological observations taken at the experiment station between 1892 and 1905; also the results of temperature and rainfall observations at various stations in the Mesilla Valley for most of the years 1851–1890, previously published in Gen. Greely's Report on the Climate of New Mexico some years ago.

Dr. W. N. Shaw, director of the British Meteorological Office, has been appointed reader in meteorology in the University of London.

R. DEC. WARD

EXPERIMENTS ON HUMAN NUTRITION

THE Carnegie Institution of Washington has for several years been interested in the study of problems in human nutrition, which it has aided with grants. One of its first undertakings in that line was in connection with the investigation carried on by Professor W. O. Atwater, at Middletown, Conn., in cooperation with this department, the work being continued under his successor, Dr. F. G. Benedict. This joint effort has been directed to increasing the efficiency and precision of the respiration calorimeter, previously developed with the aid of this department, and especially to providing the oxygen annex, making it a closed-circuit apparatus.

So great has been the interest of the institution in this work and its belief in the possibilities open to it, that it has decided to establish it as one of its permanent lines of research and to provide a special laboratory for it, as has already been done for a few other lines. The nutrition laboratory will probably be located in New York, in connection with one of the large hospitals, and will be devoted particularly to inquiries in relation to medicine, physiology and hygiene. The fitting up of the apparatus and laboratory will be in charge of Dr. Benedict, who will direct the subsequent investigation.

There are many problems concerned with nutrition in disease and convalescence, and with the energy output and hence the food requirements of the body under various pathological conditions, as well as many questions of ventilation and other branches of hygiene, to the study of which the respiration calorimeter is especially adapted. Such questions have a wide interest and are of far-reaching importance, and as the department's researches have developed there have been urgent requests that they be taken up. They are, however, distinctly separate from the investigations of the nutritive value of agricultural food products, to which the department's efforts have been directed, and have seemed rather to belong to some other agency than one working primarily in the interests of agriculture and looking to annual appropriations for continuation.

It is especially gratifying, therefore, to all interested in the subject of nutrition in its broadest aspects, that the Carnegie Institution should have recognized its importance and decided to provide for it as one of its special departments of research. It is thus given greater permanency and greater freedom in scope than could be the case under legislative appropriation, and the possibilities are opened for extending the investigation into theoretical lines where it is much needed.

Especially is this departure gratifying to

those who have been interested in the nutrition investigations under the department, for it is a direct outgrowth of the latter's work which has led up to it and made it possible. The development of the respiration calorimeter under the department's cooperation, and the fundamental inquiries which have been conducted with it for several years past, have stimulated research in this field; and as the apparatus has remained the only one of its kind in the country it has been looked to as the means of putting to exact test the deductions and conclusions from other investigation.

The wide interest awakened in nutrition studies, and the experimental methods which have been elaborated, are substantial products of the department's work and influence in this line, and the step taken by one of the highest research institutions of the country is an indication of the way in which the department's work may prepare the way for and stimulate research in the broader fields of science.

While plans for the continuation of these studies are not fully matured, it is expected that the respiration calorimeter at Middletown will be moved to Washington and installed in the new laboratories now building on the department grounds.—*Experiment Station Record.*

COMMEMORATION OF THE TWO HUNDREDTH ANNIVERSARY OF THE BIRTH OF LINNÆUS

The committee of the New York Academy of Sciences having in charge the commemoration of the two hundredth anniversary of the birth of the eminent Swedish naturalist Linnæus has completed a program of exercises and exhibits, the main features of which are as follows:

Observance of the anniversary, May 23 next, will begin at the American Museum of Natural History with an exhibition from 10 A.M. to 12 M. of specimens of American animals known to Linnæus, in charge of Frank M. Chapman, Professor W. M. Wheeler, William Beutenmueller and L. P. Gratacap, curators of the museum. These exhibitions are to be continued until May 30. At 10:30 A.M., Dr. Hovey, as secretary of the New York Academy of Sciences, will read letters concerning the anniversary received from other societies. Mr. Archer M. Huntington, president of the American Geographical Society, will deliver at 11 A.M. an address on 'North American Geography in the Time of Linnæus.' Dr. Joel A. Allen, curator of ornithology and mammalogy in the Museum of Natural History, who is one of the oldest members of the Linnæan Society of New York, has been invited to make an address at 11:30 on 'Linnæus and American Zoology.'

In the museum building of the New York Botanical Garden, from 2 to 3:45 P.M. there will be an exhibition of American plants known to Linnæus, in charge of Professor L. M. Underwood, Dr. John K. Small, Dr. P. A. Rydberg, Dr. M. A. Howe, Dr. C. B. Robinson and George V. Nash, all of the Garden staff, and an exhibition of the botanical writings and of portraits of Linnæus in charge of Miss Anna M. Vail, librarian of the garden, and Dr. John H. Barnhart, editor of the publications of the Torrey Botanical Club.

At 2:45 P.M. Dr. Per Axel Rydberg, curator of the Garden herbarium, will deliver an address on 'Linnæus and American Botany,' and an hour later there will be an exhibition of selected lantern slides of flowers of North America known to Linnæus, in charge of Professor H. H. Rusby, honorary curator of the Garden's economic museum and dean of the College of Pharmacy.

From 3:45 to 4:30 P.M. such visitors as desire will walk south from the museum building through the grounds of the garden, and Dr. W. A. Murrill, first assistant to the director, will point out characteristic American trees with which Linnæus was acquainted. Carriages will be at hand for persons who prefer to ride.

A bronze tablet commemorative of Linnæus, a gift to the city from the New York Academy of Sciences, will be unveiled, at 4:30 P.M. at the bridge over the Bronx River in Pelham Parkway. The position selected for the tablet, on the bridge itself, has been approved by Samuel Parsons, landscape architect of the park department, and the design is now before

the Municipal Art Commission for acceptance. The site of the memorial of the great Swedish naturalist is notably appropriate, as it lies between the Botanical Garden and the Zoological Park.

At the unveiling exercises an address will be made by Dr. N. L. Britton, president of the Academy of Sciences, and a number of documents will be deposited within the tablet. A speech accepting the tablet on behalf of the city will be made by Joseph I. Berry, park commissioner of the Bronx, and a representative of the New York Historical Society will accept the key of the tablet for safe keeping until May 23, 1957. Addresses will be delivered by Dr. George F. Kunz, president of the American Scenic and Historic Preservation Society, and Emil F. Johnson, president of the United Swedish Societies of New York.

In the New York Zoological Park, from 5 to 6:30 P.M., there will be an examination of the collections, with special reference to animals known to Linnæus, in the charge of William T. Hornaday, the director, and C. William Beebe, R. L. Ditmars and Dr. W. Reid Blair, of the Park staff.

At the Museum of the Brooklyn Institute, between 7:30 and 9 P.M., there will be addresses, including one by the director, Mr. F. A. Lucas, on 'Linnæus and American Natural History.' From 8:30 till 10:30 P.M., at the New York Aquarium, in Battery Park, there will be demonstrations of features of marine life recognized by Linnæus, by Charles H. Townsend, the director; Professor C. L. Bristol, of New York University, and Professor Bashford Dean, of Columbia University. All the exercises will be open to the public.

The committee consists of Dr. N. L. Britton, Dr. H. C. Bumpus, F. A. Lucas, William T. Hornaday, Charles H. Townsend and Professor Wm. M. Wheeler.

SCIENTIFIC NOTES AND NEWS

AT the meeting of the National Academy of Sciences, held in Washington last week, President Ira Remsen, of the Johns Hopkins University, was elected president to succeed Mr. Alexander Agassiz. The vacancy in the vice-presidency thus created was filled by the election of Dr. Charles D. Walcott, secretary of the Smithsonian Institution, and Mr. Arnold Hague was reelected home secretary. Members were elected as follows: Joseph P. Iddings, professor of petrology, University of Chicago; Harmon N. Morse, professor of chemistry, Johns Hopkins University; Franklin P. Mall, professor of anatomy, Johns Hopkins University, and Elihu Thomson, Thomson-Houston and General Electrical Companies. The four following foreign associates were elected: Sir James Dewar, LL.D., F.R.S., London; Professor A. R. Forsythe, Cambridge, England; Professor Dr. David Hilbert, Göttingen, Germany; Professor J. C. Kapteyn, Gröningen, Holland. The council is constituted as follows: Mr. Alexander Agassiz, Cambridge, Mass.; Professor R. H. Chittenden, New Haven, Conn.; Professor Geo. E. Hale, Pasadena, Calif.; Professor Henry F. Osborn, New York City; Dr. W. H. Welch, Johns Hopkins University; Dr. R. S. Woodward, Carnegie Institution, Washington. The autumn meeting will be held at Columbia University, New York, the sessions beginning on November 19.

DR. FRANZ BOAS, professor of anthropology in Columbia University, was presented on April 16 with a volume of researches by his colleagues and former students in honor of the twenty-fifth anniversary of his doctorate. The presentation was made by President Butler in the presence of the council, members of the division of philosophy, psychology and anthropology and invited guests.

COUNT DE MONTESSUS DE BALLORE, of Abbeville, France, one of the leading authorities on earthquakes, has accepted a call from the government of Chili to establish for them a seismological service of the first rank. This action on the part of the Chilian government is a direct result of the disastrous Valparaiso earthquake of last August, and sets a good example to some more advanced nations. The service in question will, at the beginning, include one station of the first rank and three of the second, to be subsequently further enlarged. The count will travel *via* New York

and San Francisco, arriving in New York early in May.

Professor Emile Goldi, director of the Museum Goldi, at Belem, Para, Brazil, has resigned after thirteen years of service and twenty-five years of residence in tropical Brazil. He has been appointed honorary director of the museum and will hereafter be connected with the University of Bern, where he will work up the scientific material of the natural history and ethnography of the Amazon region. Dr. Jacques Huber, chief of the section of botany, has been appointed director of the museum.

Dr. Edward S. Morse has been elected a foreign member of the Astronomical Society of France.

Sir James Dewar, Jacksonian professor of experimental philosophy at Cambridge University and Fullerian professor of chemistry at the Royal Institution, London, has been elected a corresponding member of the Academy of Sciences at Copenhagen.

The Royal medals of the Royal Geographical Society have been awarded to Dr. Francisco Moreno, for more than twenty years work in South American exploration, and Captain Roald Amundsen, the Norwegian explorer, for his voyage through the Northwest Passage, and observations in the neighborhood of the North Magnetic Pole.

The grand prize of the Milan Exhibition of 1906 has been awarded to the Wellcome Chemical Research Laboratories for their exhibit illustrating researches conducted in the laboratories. Gold medals were awarded to Dr. F. B. Power, director, and to Mr. F. Tutin and a silver medal to Mr. P. E. F. Perrédès.

Professor W. Kükenthal, director of the zoological laboratory at Breslau, and Dr. H. Hartmeyer, of the Berlin Zoological Museum, have been sent by the Berlin Academy of Sciences to make collections and studies in the West Indies.

Commander Peary has been given three years leave of absence by the Navy Department, and it is said that a fund of $200,000 has been provided to enable him to continue his researches in the Arctic regions.

Dr. William Osler, regius professor of medicine of Oxford University, will deliver the principal address at the celebration of the fiftieth anniversary of the Pathological Society of Philadelphia, which will occur on May 10.

During March Professor T. C. Chamberlin, of the University of Chicago, delivered three lectures on geological subjects at the University of Wisconsin.

Dr. Friedjof Nansen will read a paper entitled 'Polar Problems' at the meeting of the Royal Geographical Society on April 29. On May 13 Lieutenant Boyd Alexander will describe 'An Expedition from the Niger to the Nile.'

On the thirteenth of May Augustana College, Rock Island, Ill., will celebrate the bicentenary of the birth of Linné. Professor Bessey, of the University of Nebraska, is to deliver the address, which will be on 'The Place of Linné in the Scientific World.' This date (old style) has been selected in order not to conflict with the exercises of commencement week, which come at the anniversary, new style (May 23).

A joint session of the Departments of Mathematics and Physics was held at Clark University, on April 15, in commemoration of the two-hundredth anniversary of the birth of Leonhard Euler. Addresses were made by Professor W. E. Story on Euler's life and work, and by Professor A. G. Webster on his achievements in connection with physics and astronomy.

A monument in honor of Eugène Risler, director of the National Institute of Agriculture at Paris from 1879 to 1900, was unveiled in the garden of the institute, on March 24, by M. Ruau, minister of agriculture.

The Rev. Dr. James Addison Quarles, D.D., LL.D., for twenty-one years professor of moral philosophy at Washington and Lee University, died on April 13, at the age of seventy years.

Professor Arthur Baessler, known for his work on the archeology of Peru and for his

collections from Peru, given to the Berlin Museum, died on March 31.

To the list of government appropriations for scientific purposes for the fiscal year ending June 30, 1908, published in SCIENCE last week, should be added the following, under the head of Permanent Appropriations:

To the Agricultural Colleges in 48 States and Territories, under act of August 30, 1890 (Morrill Act)	$1,200,000
To the Agricultural Experiment Stations in 48 States and Territories, for original research, under act of March 16, 1906 (Adams Act)	$432,000

MEDICAL journals state that among the appropriations recently voted by the German parliament is $50,000 for repression of typhoid fever and $30,000 for tuberculosis; $16,000 for study of sleeping sickness; $17,500 for the approaching International Congress for Hygiene at Berlin, September 23–29; $25,000 for research on syphilis; $6,500 for investigation of the statistics of accidents and $10,000 for combating infant mortality.

IT is reported that Mr. A. P. Widener has offered to erect in the city of Philadelphia a municipal art gallery at a cost of $10,000,000 and to cooperate with others in providing a collection of paintings.

SIR ANDREW NOBLE has given £200 to the Royal Institution for the fund for the promotion of experimental research at low temperatures.

THE committee on seismology appointed at the recent meeting of the American Association for the Advancement of Science, held its first meeting at the Cosmos Club, Washington, on the morning of April 19. The question of a National Bureau of Seismology was one of those considered by the committee.

THE American Academy of Political and Social Science held its eleventh annual meeting at Philadelphia, beginning on April 19. The special topic for consideration was 'American Colonial Policy and Administration.' Ambassador Bryce made an address on 'Some Difficulties in Colonial Government encountered by Great Britain, and how they have been met.'

THE American Mosquito Extermination Society held its fourth annual meeting in New York City on April 19. Addresses were made by Dr. L. O. Howard, chief of the Division of Entomology, U. S. Department of Agriculture, and Dr. E. P. Felt, New York state entomologist.

A TELEGRAM was received at Harvard College Observatory on March 15 from Professor G. C. Comstock, director of Washburn Observatory, stating that a comet was discovered by Mellish at Madison, Wis., on April $14^d.679$ G. M. T. in R. A. $6^h\ 50^m$ and Dec. $+8^s$.

Daily motion in R. A. $+3°$.
" " " Dec. $+7°$.

The comet is large, faint and diffuse, and is visible in a small telescope. The comet has since been observed at the Yerkes Observatory, the Lick Observatory and the U. S. Naval Observatory. At the latter institution the elements and ephemeris have been computed from observations made on April 15 and 16 as follows:

Elements

Time of passing perihelion	$= T = 1907$, March $27^d.56$ G. M. T.
Perihelion minus node	$= \omega = 328° 47'$
Longitude of node	$= \Omega = 189° 07'$
Inclination	$= i = 110° 12'$
Perihelion distance	$= q = 0.924$

Ephemeris

G. M. T.	R. A.	Dec.	Light
	h m s	° ′	
1907 Apr. 18.5	7 19 49	+26 01	0.59
" " 22.5	7 45 40	+35 36	
" " 26.5	8 3 41	+40 58	
" " 30.5	8 17 08	+44 17	0.11

The British Medical Journal says: "Just twenty-five years ago, on March 24, 1882, Robert Koch gave to the world his discovery of the tubercle bacillus. At a meeting of the Berlin Physiological Society he read a paper on tuberculosis, in which he reported fully his culture experiments, and ended by saying that the result of these researches was that certain bacilli were invariably present in tuberculous tissue, that these bacilli could be detached from the organism and preserved in pure cultures for a length of time, and that animals infected by various methods with the isolated bacilli become tuberculous. From this it is fair to conclude that tubercle bacilli consti-

tuted the true cause of tuberculosis, which therefore must be considered a parasitic disease. Six months earlier, in the autumn of 1881, Koch had demonstrated his culture and staining methods to the International Medical Congress in Lord Lister's laboratory. On his return to Berlin he continued his researches, and, making use of Ehrlich's methylene-blue pigment, discovered a bacillus present in none but tuberculous matter. In order to bring this out clearly on the plate, Koch stained with Bismarck-brown, and found that the bacilli retained their blue color, while all the rest grew brown. This gave him a method of demonstrating the presence even of isolated tubercle bacilli."

UNIVERSITY AND EDUCATIONAL NEWS

Yale University has received two bequests of $100,000 each—one from William C. Eggleston, of New York City, and one for a scholarship from Lura Currier, of New York City, accruing by the death of E. W. Currier.

At the University of Nebraska a general advance of two to three hundred dollars in salaries of deans and professors and of about one hundred dollars for instructors has been ordered by the regents.

At the same institution the regents are planning to begin the erection of an Engineering Hall. At least $50,000 will be spent upon the foundation and the lower stories during the present year, and it is hoped to complete it later with as much more. On the Experiment Station Farm they plan to erect a new heating plant, a stock pavilion, a feeding barn and to complete the woman's building, for which the sum of $100,000 was appropriated by the state legislature. They will expend $25,000 during the next two years upon the North Platte substation, mainly in permanent improvements, and have set aside a fund of $15,000 for state farmers' institutes for the biennium.

The Massachusetts Institute of Technology has received a bequest of $5,000 by the will of Alexander S. Wheeler, of Boston.

The medical building of McGill University was destroyed by fire on April 15. The building was erected at a cost of about $350,000 and contained collections and apparatus of great value. It is said that about half the loss is covered by insurance. It will be remembered that an equally disastrous fire destroyed the engineering building of McGill University about two weeks ago.

The University of California announces the establishment of a resident graduate fellowship in anthropology of a value of five hundred dollars. Applications for the award for 1907–'08 should be sent to the secretary of the Department of Anthropology of the University, at the Affiliated Colleges, San Francisco, on or before May 10, and should be accompanied by all information or records submitted in support.

Dr. C. Judson Herrick, professor of zoology at Dennison University, has been elected professor of neurology in the University of Chicago, the appointment to take effect at the beginning of the next academic year. The chair at Denison University will be filled by Dr. George E. Coghill, professor of biology at Willamette University, Salem, Oregon.

At the Johns Hopkins University, Dr. H. S. Jennings has been promoted to the position of professor of experimental zoology.

At the recent annual meeting of the regents of the University of Nebraska the following promotions to full professorships were made in the scientific departments: A. L. Candy from associate professor of mathematics to professor of pure mathematics; H. H. Waite from associate professor of bacteriology and pathology to professor of the same; C. C. Engberg from assistant professor of mathematics to professor of applied mathematics.

Dr. Corbett, professor of pathology in Sheffield University, has been appointed lecturer in bacteriology in Cambridge University. He is succeeded at Sheffield by Dr. J. M. Beattie, senior assistant to the professor of pathology at Edinburgh University.